

## **Algebra-Based Physics with Earth Science Essential Curriculum**

### **Unit 1 Kinematics**

Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. ([HS-PS2-1](#))

### **Unit 2 Dynamics, Gravity & Dynamics of Uniform Circular Motion**

Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. ([HS-ESS1-4](#))

Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. ([HS-PS2-4](#))

### **Unit 3 Energy, Weather, and Climate & Impulse and Momentum**

Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motion of particles (objects) and energy associated with the relative positions of particles (objects). ([HS-PS3-2](#))

\*Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. ([HS-PS3-3](#))

Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. ([HS-ESS3-1](#))

Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. ([HS-ESS3-6](#))

Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. ([HS-ESS2-4](#))

Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. ([HS-ESS2-2](#))

\*Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. ([HS-ESS1-6](#))

Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. ([HS-PS2-2](#))

Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. ([HS-PS2-3](#))

\*Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. ([HS-ESS1-6](#))

#### **Unit 4 Waves & Optics**

\*Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. ([HS-PS4-1](#))

Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy. ([HS-PS4-5](#))

Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. ([HS-ESS1-2](#))

#### **Unit 5 Electrostatics & Magnetism and Electromagnetism**

Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction. ([HS-PS3-5](#))

Evaluate questions about advantages of using a digital transmission and storage of information. ([HS-PS4-2](#))

Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. ([HS-ESS2-3](#))

#### **Unit 6 Atomic and Nuclear Physics**

Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation. ([HS-ESS1-1](#))

Communicate scientific ideas about the way stars, over their life cycle, produce elements. ([HS-ESS1-3](#))

\*Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. ([HS-ESS1-6](#))

## **Unit 7 Thermodynamics**

Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. ([HS-ESS1-5](#))

Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. ([HS-ESS2-1](#))

Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth's systems. ([HS-ESS3-5](#))