

HCPS Physics Course

Unit & Title	MSDE/NGSS Science Standards	Lesson Topic	
Unit 1 – Kinematics I <i>13 Class Periods</i>	HS-PS2-1 : 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-ESS2-1 : 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.	Experience 1	Position vs. Time
		Experience 2	Dimensional Analysis and Plate Tectonics
		Experience 3	Velocity and Acceleration
		Experience 4	Free Fall

Unit & Title	MSDE/NGSS Science Standards	Lesson Topic	
Unit 2 – Kinematics II <i>10 Class Periods</i>	HS-PS2-1 : 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.	Experience 1	Projectile Analysis
		Experience 2	Vector Analysis
		Experience 3	Horizontal Projectile Lab

		Experience 4	Catapult Project
		Experience 5	From Way Downtown Lab
		Experience 6	Water Fountain Lab

Unit & Title	MSDE/NGSS Science Standards	Lesson Topic	
Unit 3 – Forces and Laws of Motion <i>10 Class Periods</i>	<p>HS-PS2-1: 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.</p> <p>HS-PS2-4: Use mathematical representations of Newton’s Law of Gravitation and Coulomb’s Law to describe and predict the gravitational and electrostatic forces between objects.</p> <p>HS-ESS1-4: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.</p>	Experience 1	Force, Mass Acceleration Relationship
		Experience 2	May Force Be With You Lab
		Experience 3	Newton’s Scooter Lab
		Experience 4	Kapler’s Laws and Planetary Motion
		Experience 5	Universal Law of Gravitation and Kepler’s Laws
		Experience 6	Static and Kinetic Friction Lab
		Experience 7	Tension Lab

Unit & Title	MSDE/NGSS Science Standards	Lesson Topic	
<p>Unit 4 – Work, Energy and Power 10 Class Periods</p>	<p>HS-PS3-1: Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.</p> <p>HS-PS3-2: Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).</p> <p>HS-PS3-3: Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.</p> <p>HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth’s systems result in changes in climate.</p>	Experience 1	Energy Conversion Project
		Experience 2	Kinetic Energy of Impact Craters
		Experience 3	Modified Atwood Non-Conserved
		Experience 4	Roller Coaster Analysis
		Experience 5	Work, Energy, Power Analysis
		Experience 6	Energy and Planet Earth

Unit & Title	MSDE/NGSS Science Standards	Lesson Topic	
<p>Unit 5 – Momentum and Collisions 8 Class Periods</p>	<p>HS-PS2-2: 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.</p> <p>HS-PS2-3: Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.</p> <p>HS-ESS2-1: 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.</p> <p>HS-ESS2-2: Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.</p>	Experience 1	Conservation of Momentum – Collision Lab
		Experience 2	Momentum and Impulse Introduction
		Experience 3	Soft Landing – Engineering Design Challenge
		Experience 4	Impulse Bumper Lab
		Experience 5	Momentum and Plate Tectonics Project
		Experience 6	Ballistic Pendulum Lab

Unit & Title	MSDE/NGSS Science Standards	Lesson Topic	
<p>Unit 6 – Electricity and Magnetism 13 Class Periods</p>	<p>HS-PS2-4: Use mathematical representations of Newton’s Law of Gravitation and Coulomb’s Law to describe and predict the gravitational and electrostatic forces between objects.</p>	Experience 1	Coulomb’s Law Interactive Lab
	<p>HS-PS2-5: Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.</p>	Experience 2	Discovering Ohm’s Law Lab
	<p>HS-PS2-6: Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.</p>	Experience 3	Electricity and Magnetism Lab
	<p>HS-PS3-5: 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.</p>	Experience 4	Types of Circuits Lab
	<p>HS-PS3-5: 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.</p>	Experience 5	Voltage and Current Lab
	<p>HS-PS3-5: 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.</p>	Experience 6	What is an Electrical Circuit Lab

Unit & Title	MSDE/NGSS Science Standards	Lesson Topic	
Unit 7 – Waves <i>12 Class Periods</i>	HS-PS4-1 : Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.	Experience 1	Doppler Shift
	HS-PS4-2 : Evaluate questions about the advantages of using a digital transmission and storage of information.	Experience 2	EM Technological Devices
	HS-PS4-3 : Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.	Experience 3	Reflection Lab
	HS-PS4-4 : Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.	Experience 4	Refraction and Earth’s Layers
	HS-PS4-5 : 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.	Experience 5	Refraction of Light in Glass
	HS-ESS1-2 : Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant	Experience 6	Total Internal Reflection
		Experience 7	Seeing What You Hear Lab

	galaxies, and composition of matter in the universe. HS-ESS2-3 : Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.		
		Experience 8	Speed of Sound Lab
		Experience 9	Spherical Mirrors
		Experience 10	Wave Properties