High School Course Sequence

CVUSD Pacing Guide 2023- 2024: NGSS Physics

Overview:
In this NGSS aligned physics course, students will explore physical science concepts that build comprehension around the mechanics of the world and universe. The course will look at the
In the fall semester, students will investigate the mechanics of motion in both one and two dimensions as well as how motion correlates to both momentum and energy. The final area of study will be the physics of waves and light and how the wave motions impact all matter in the universe. In the spring semester, students will develop their understanding of electricity by building on their understanding of waves and conservation of energy from the fall semester. The students will deepen their understanding of magnetism and how it impacts motion and interactions of all matter in the universe. The final areas of Subatomic, nuclear and particle physics will look at the unseen areas of physics and how they allow for everyday things like GPS and the Earth's crust.

Rationale for flow:
This Physics Scope & Sequence follows a macroscopic to microscopic path. The fall semester focuses on building observable phenomena and in the spring semester, students apply the knowledge they have gained to understand more advanced concepts. When students are provided with the opportunity to observe and then apply their foundational knowledge of physics concepts to relevant topics that include NGSS, we help prepare students for college, career, and life. Our students will graduate with learning experiences that prepare them to apply learning to personal decisions related to real-world problems. There will be several opportunities for students to focus on solutions to real world issues throughout the semester.

Semester	**Fall 2023(August 24 - January 23)**					**Spring 2024 (January 24 - June 11)**			
	Quarter 1 (August 24 - October 27)			**Quarter 2 (October 28 - January 23)**		**Quarter 3 (January 23 - April 8)**		**Quarter 4 (April 9 - June 11)**	
Unit Title	**Create and Maintain Effective Environments for Student Learning**	**Mechanics in One Dimension**	**Mechanics in Two Dimensions**	**Momentum and Energy**	**Waves and Light**	**Electricity**	**Magnetism**	**Subatomic Physics and Quantum Theory**	**Nuclear and Particle physics**
Common Formative Assessment	SI Units worksheet. Graphing seating plan	Graphing worksheet Scalar vs Vector worksheet	Weighted cars and worksheet	Weighted cars and worksheet 2	Waves Diagnostic test by Michael Whittman	Circuits worksheet and hands on panels Crazy Circuits or similar	Magnets and building an electromagnet		
Estimated Length of Time	~ 4 days	~ 23 days	~22 days	~25 days	~20 days	~23 days	~22 days	~25 days	~20 days
Essential Question(s)	• Introduce syllabus, routines, and procedures • Teach prerequisite skills • Build Relationships	• *What can we observe about one dimensional motion?* • *What is the math behind one dimensional motion?*	• *How is two dimensional mechanics different from one dimensional?* • *How can we mathematically represent two dimensional mechanics?*	• *Using the knowledge of one and two dimensional mechanics what is momentum and energy?* • *Newton's laws*	• *How do we represent waves and light?* •	• *Using the knowledge of waves and energy how can you mathematically explain the travel of electricity?* • *How does electricity interact with matter?*	• *How does a magnet work?* • *How does electricity and magnetism interact?* • *What are real world applications?*	• *What is an atom?* • *What is Quantum Theory?* • *How is this the basis for modern technology?*	• *Theories behind the solid state electronic?* • *What is the Nucleus of the atom?* • *What is Nuclear Decay?* • *How are these the building blocks of matter?*
NGSS		HS-PS2-2 HS-PS2-2	HS-PS2-3 HS-PS2-4	HS-PS2-6 HS-PS3-1	HS-PS3-5 HS-PS4-1	HS-PS1-7 HS-PS3-1	HS-PS1-1 HS-PS1-8	HS-PS1-1 HS-PS1-2	HS-PS1-5 HS-PS1-6

Performance Expectations		HS-PS2-3	HS-PS2-5 HS-ESS1-3 HS-ESS1-4	HS-PS3-2 HS-PS3-3 HS-PS3-4 HS-ESS2-3 HS-ESS2-4	HS-PS4-2 HS-PS4-3 HS-PS4-5 HS-ESS1-1 HS-ESS2-4 HS-ESS2-5	HS-PS3-2 HS-PS3-3 HS-PS4-1	HS-PS3-4 HS-PS3-5 HS-ESS2-2	HS-PS1-3 HS-ESS1-4 HS-PS1-7	HS-PS1-8 HS-ESS1-3
Unit Description	The students will receive the syllabus. They will have an explanation of routines, expectations and procedures. The students will learn the prerequisite skills.	Students will have a discussion of motion. They will learn to diagram motion in one dimension. They will practice graphing for position and time. The students will learn the equations for velocity, position, and speed. The students will learn scalar versus vector measurements.	The students will have more practice with vectors. The students will learn the mathematical relationships of vectors as well as how to work with them. They will look at friction in both the real world and mathematical models as well as looking at the forces in two dimensions as well as projectile and centripetal motion. The students will use the new knowledge to look at both real world and mathematical models of the applications of centripetal force and projectile motion.	The students will look at the momentum and energy in both real world and mathematical models. The students will apply prior knowledge to the explanation of momentum and its conservation. The students will look at thermal energy as it naturally occurs in the Earth's processes including volcanoes and the movement of the tectonic plates. The students will delve into the states of matter, they will look at the different properties of fluids and force within liquids, solids and gasses.	The students will expand on prior knowledge to understand the phenomena of waves in the different impact that they have on all matter in the universe. The students will look at the waves and vibrations associated with sound and light. The students will also look at the fundamentals of light, the reflection, refraction, interference and diffraction. The students will model these in the real world and in a mathematical model.	The students will look at electrostatic energy and how it works. The students will have real world applications to understand electricity and electric currents. The students will be given the opportunity to mathematically and conceptually model the flow of an electric current, circuits and electrostatic energy.	The students will look at the magnetic fields on Earth and use that as the point to go deeper into magnetism. The students will apply the CER to understand the phenomena. They will look at Magnetic force and electromagnetism in both real world and mathematical models.	The students will examine the ideas behind quantum theory and the atom. They will look at what an atom is and what it means in the creation of energy and matter.	The students will learn the theoretical, mathematical, and real world approach to the nucleus and nuclear decay.
Disciplinary Core Ideas addressed in NGSS PEs		Types of Interactions Conservation of Energy and Energy Transfer	Types of Interactions Definition of Energy	Structure and Properties of Matter Types of Interactions Definition of Energy	Structure and Properties of Matter Chemical Reactions Energy in Chemical Processes Definition of Energy	Definition of Energy **Structure and Properties of Matter** **Types of Interactions** Electromagnetic Radiation	Definitions of Energy Conservation of Energy and Energy Transfer Structure and Properties of Matter	Chemical Reactions Energy in Chemical Reactions Structure and Properties of Matter Types of Interactions	Chemical Reactions Optimizing the Design Solution **Energy in Chemical Reactions**
Science and Engineering Practices		**The 8 Science and Engineering Practices should be used throughout each year with an emphasis on 2-3 per unit.**							
	•	• Developing and Using Models	• Developing and Using Models • Constructing Explanations and	• Planning and Carrying Out Investigations	• Constructing Explanations and Developing Solutions	• Developing and Using Models • Analyzing and Interpreting Data	• Developing and Using Models	• Developing and Using Models	• Constructing Explanations and Developing Solutions

addressed in NGSS PEs			Developing Solutions	• Obtaining, Evaluating, and Communicating Information	• Developing and Using Models • Using Mathematics and Computational Thinking • Planning and Carrying Out Investigations	• Using Mathematics and Computational Thinking	• Planning and Carrying Out Investigations • Using Mathematics and Computational Thinking	• Constructing Explanations and Developing Solutions • Analyzing and Interpreting Data • Planning and Carrying Out Investigations	• Analyzing and Interpreting Data • Planning and Carrying Out Investigations • Using Mathematics and Computational Thinking
Crosscutting Concepts		**The 7 Crosscutting Concepts should be used throughout each year with an emphasis on 2-3 per unit.**							
addressed in NGSS PEs	•	• Structure and Function • Patterns • Energy and Matter	• Patterns • Energy and Matter • Systems and System Models	• Patterns • Structure and Function	• Patterns • Energy and Matter	• Cause and Effect • Energy and Matter • Stability and Change • Patters	• Energy and Matter • Systems and System Models • Cause and Effect • Patterns	• Patterns • Systems and System Models • Stability and Change • Cause and Effect • Energy and Matter	• Stability and Change • Systems and System Models • Patterns • Structure and Function