URBANDALE COMMUNITY SCHOOL DISTRICT

Course Title:	**Physical Science**
Description: Physical Science introduces students to both Physics and Earth science. Physical Science is a two-semester guided inquiry course. The first semester focuses on modern concepts in physics. These topics include motion, forces, energy, electricity, magnetism, and waves. The second semester will focus on Earth Science concepts in the fields of astronomy, geology, environmental science, and climatology.	

Physical Sciences

Reporting Topic	Grade Level Standards	Competency Statement
Motion	• **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-PS 2-2)**	Students will mathematically, graphically, and conceptually describe the motion of objects.
Forces	• **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-PS 2-1)** • **Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. (HS-PS 2-3)**	Students will mathematically and conceptually apply Newton's Laws
Energy	• **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. (HS-PS 3-1).** • **Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. (HS-PS 3-3)**	Students will mathematically and conceptually apply The Law of Conservation of Energy.
Electromagnetism	• **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. (HS-PS 2-5)** • **Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes**	Students will utilize circuits to explain the properties of electricity and magnetism.

	in energy of the objects due to the interaction. (HS-PS 3-5) • **Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter. (HS-PS 4-4)** • **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-PS 4-5)**	
Waves	• **Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. (HS-PS4-1)** • **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. (HS-PS4-3)** • **Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter. (HS-PS4-4)** • **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)**	Students will mathematically and conceptually describe the functions of waves.
Earth and Space Sciences		
Stars	• **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-ESS 1-1)** • **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-ESS 1-2)** • **Communicate scientific ideas about the way stars, over their life cycle, produce elements. (HS-ESS 1-3)**	Students will examine the processes governing the formation, evolution, and workings of the universe
Planets	• **Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. (HS-ESS 1-4)** • **Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of**	Students will examine the processes governing the

	Earth's formation and early history. (HS-ESS 1-6)	formation, evolution, and workings of the solar system
Plate Tectonics	• **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-ESS 1-5)** • **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-ESS 2-1)** • **Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.(HS-ESS 2-3)** • **Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. (HS-PS 4-1)** • **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. (HS-PS 4-3)**	Students will develop models and explanations for the ways different Earth systems control the appearance of the Earth's surface.
Water	• **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-ESS 2-2)** • **Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. (HS-ESS 2-5)** • **Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* (HS-ESS 3-4)**	Students will examine the surface processes of water and how its effects on Earth cause changes in other natural systems.
Climate	• **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 ESS 2-4)** • **Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. (HS-ESS 2-6)** • **Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth. (HS-ESS 2-7)** • **Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or**	Students will examine the ways that human activities and natural changes impact climate change and how that affects natural systems.

	regional climate change and associated future impacts to Earth systems. (HS-ESS 3-5) • **Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. (HS-ESS 3-6)**	

Engineering

Reporting Topics	**Grade Level Standards**	**Competency Statement**
Evaluating and Testing Solutions	• **Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. (HS-ETS1-3)** • **Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. (HS-ETS1-4)**	Students will evaluate and model a complex real world problem and proposed solutions