Physical Science, Part 2
Course Outline & Objectives

Course Description:

In Physical Science, Part 2, students will explore the physical principles that govern motion, forces, energy, waves, electricity, and magnetism. The course begins with the study of kinematics, where students learn how to describe and calculate motion using position, velocity, and acceleration graphs. They then apply Newton's Laws to analyze how forces influence motion, exploring friction, gravity, and orbital motion. Next, students investigate work, energy, and momentum, examining conservation laws through collisions and energy transformations. The course continues with a study of waves, including mechanical and electromagnetic types, and their real-world applications in communication and medicine. Students then explore electricity and magnetism, connecting electrostatic forces, circuits, and magnetic fields to everyday technologies. Finally, the course concludes with an investigation of renewable energy, comparing sources such as solar, wind, geothermal, biomass, and hydro power to understand their environmental and societal impacts.

Credits - One Semester (0.5 Carnegie unit / CA: 5 credits)

Course Outline

Unit 1: Motion
1.1 Identifying Objects in Motion
1.2 1D Kinematics
1.3 Graphing Motion
1.4 Horizontal Motion
1.5 Vertical Motion

Unit 2: Newton's Laws
2.1 Forces
2.2 Newton's 1st Law
2.3 Newton's 2nd Law
2.4 Newton's 3rd Law
2.5 Universal Law of Gravitation

Unit 3: Work and Energy
3.1 Impulse and Momentum
3.2 Elastic and Inelastic Collisions
3.3 Work
3.4 Kinetic and Potential Energy
3.5 Conservation of Energy

Next Generation Science Standards

In Unit 1 students will:
Identify objects that are in motion.
Identify variables as scalar or vector.
Read and interpret p vs t, v vs t, and a vs t graphs.
Solve problems with vertical and horizontal kinematics equations.
[HS-PS2-1, HS-PS2-2, HS-PS3-1, HS-PS3-2]

In Unit 2 students will:
Identify changes to motion using inertia.
Use mathematical expressions to describe the movement of an object.
Identify action reaction pairs.
Explain orbital patterns using UCM and Newton's Universal Law of Gravitation.
[HS-PS2-1, HS-PS2-2, HS-PS2-3, HS-PS2-4]

In Unit 3 students will:
Describe how Newton's 3rd Law is related to momentum.
Use changes in momentum to describe how force and time of impact are inversely related.
Define and identify types of energy (kinetic, gravitational potential, elastic potential).
Use energy and momentum to solve collision problems.
Use mathematical expressions to describe the energy of an object.
Describe the transfer of energy using the Law of Conservation of Energy and Total Mechanical Energy.
[HS-PS2-2, HS-PS3-1, HS-PS3-2, HS-PS3-3, HS-PS3-4]

Course Outline

Unit 4: Waves

4.1 Waves
4.2 Waves and the Earth
4.3 Electromagnetic Waves
4.4 Medical Imaging
4.5 Digital Transmissions

Next Generation Science Standards

In Unit 4 students will:

Describe the relationship between frequency and time period.
Identify waves as mechanical waves (transverse and longitudinal) or electromagnetic waves.
Identify parts of a transverse and longitudinal wave.
Describe how the medium changes the wave.
Solve problems using the speed of a wave formula.
Describe the difference between a P wave and S wave.
Describe how earthquakes impact buildings and cause Tsunamis.
Explain how light can be both a wave and a photon.
Describe electromagnetic waves by unique wavelengths and frequencies.
Explain how electromagnetic waves are used in ultrasounds and X-rays.
Explain how electromagnetic waves are used in cell phone, wifi, and bluetooth technology.
[HS-PS4-1, HS-PS4-3, HS-PS4-4, HS-PS4-5]

Unit 5: Electricity and Magnetism

5.1 What is Electricity?
5.2 Magnetism
5.3 Powering Your Devices
5.4 Powering Your Home
5.5 Wiring Your Home

In Unit 5 students will:

Determine the force of attraction/repulsion between two charged particles.
Explain how a magnetic field generates electricity
Identify the difference between insulators and conductors.
Describe the difference between AC and DC circuits.
Explain how the power grid works.
List the different types of batteries and explain how they work.
Describe how power gets to your home and how current flows through a circuit based on Ohm's Law and Kirchhoff's Law.
[HS-PS2-4, HS-PS2-5, HS-PS3-3, HS-PS3-5]

Unit 6: Renewable Energy

6.1 Sources of Electricity
6.2 Solar
6.3 Wind
6.4 Geothermal
6.5 Hydro

In Unit 6 students will:

Differentiate between renewable and nonrenewable resources.
Identify advantages and disadvantages of geothermal power.
Identify advantages and disadvantages of hydro power.
Identify advantages and disadvantages of wind power.
Identify advantages and disadvantages of solar power.
[HS-PS3-3, HS-PS3-4]