

Wyoming Department of Education Required Virtual Education Course Syllabus

Sheridan County School District # 1

Program Name	Sheridan County School District #1 Virtual School	Content Area	SC
Course ID	AC03152	Grade Level	11 - 12
Course Name	Honors Physics	# of Credits	1
SCED Code	03152	Curriculum Type	Acellus

COURSE DESCRIPTION

In the Acellus Honors Physics course leads students through an investigation of matter and its motion through time and space, along with related concepts such as energy and force. The Acellus Honors Physics course was developed to help students build a strong foundation in basic physics prior to taking Advanced Placement Physics. We have found that students often struggle with AP Physics when they have a weak foundation in the basic concepts and mathematical skills of general physics. Acellus Honors Physics helps to fill in holes in student understanding, helping them to create a strong foundation of general physics concepts upon which they can build. Acellus Honors Physics is A-G Approved through the University of California.

WYOMING CONTENT AND PERFORMANCE STANDARDS

STANDARD #	BENCHMARK (Standard/Indicator) Use the Standards and Benchmarks as Spreadsheets
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-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.
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.
HS-PS2-4	Use mathematical representations to predict the gravitational and/or electrostatic forces between objects using Newton’s Law of Gravitation and/or Coulomb’s Law, respectively.
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.
HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of materials.
HS-PS3-1	Create or apply 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-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 position of particles (objects).
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.
HS-PS3-4	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system.
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.
HS-PS4-1	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-PS4-2	Evaluate the advantages and disadvantages of using digital transmission and storage of information.

HS-PS4-3	Evaluate evidence 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-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
HS-ETS1-3	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-ETS1-4	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.

SCOPE AND SEQUENCE

UNIT OUTLINE	STANDARD#	OUTCOMES OBJECTIVES/STUDENT CENTERED GOALS
Unit 1 – Introduction to Physics		In this unit students learn about what Physics is, measured numbers, using significant digits, scientific notation, and the metric system. Students also learn about math with units, and conversions.
Unit 2 – 1-D Kinematics	HS-PS2-2	In this unit students learn about position and displacement, average velocity, position graphs, velocity graphs and acceleration, positive, minus, and zero acceleration. Students also learn about 1-D kinematic equations, using motion equations, solving motion problems, free fall and gravity, solving a quadratic for time, and 2-part motion problems.
Unit 3 – Vectors and 2-D Kinematics	HS-PS2-2	In this unit students learn about vectors an 2-D motion, graphical addition of vectors, vector components, and vector magnitude and direction. Students also learn about analytical addition of vectors, unit vector notation, breaking down and solving 2-D motion, projectile motion, and range versus angle.
Unit 4 – Forces and Newton's Laws	HS-PS2-1; HS-PS2-2	In this unit students learn about dynamics and Newton's second law – single force, Newton's first law, multiple forces, weight, and Newton's third law and normal force. Students also learn about kinetic and static friction, friction problems, 2-D force problems and examples of these problems, inclined plane, examples of inclined plane, and inclined plane with friction.
Unit 5 – Circular Motion and Gravity	HS-PS2-4; HS-ETS1-2; HS-ETS1-3	In this unit students learn about uniform circular motion, centripetal force and acceleration, period, vertical circles, centripetal versus centrifugal force, and the force and acceleration of gravity. Students also learn about gravity and orbits, and Kepler's Law.
Unit 6 – Energy	HS-PS3-1; HS-PS3-3	In this unit students learn about work, including positive and negative work, work and energy, and kinetic energy. Students also learn about gravitational potential energy, mechanical energy, energy problems with and without work, energy of a pendulum, elastic potential energy, and power.

Unit 7 – Momentum	HS-PS2-3; HS-ETS1-2; HS-ETS1-3; HS-ETS1-4	In this unit students learn about momentum, impulse, and conservation of momentum. They also learn about collisions, inelastic collisions, recoil, elastic collisions, and 2-D momentum.
Unit 8 – Rotational Motion	HS-PS2-2	In this unit students learn about rotational kinematics, rotational motion problems, and rotational and linear motion. They also learn about torque, equilibrium, moment of inertia, rotational dynamics, rotational kinetic energy, and angular momentum.
Unit 9 – Fluid Mechanics		In this unit students learn about fluids, pressure, pressure and depth, and Pascal's principal. They also learn about buoyant force, buoyant force with air, flow rate, bernoulli equation, and bernoulli examples.
Unit 10 – Thermodynamics	HS-PS3-4	In this unit students learn about heat, temperature, thermal expansion, heat and temperature change, and calorimetry. They also learn about phase change, calorimetry with phase changes, measuring gases, behavior of gases, kinetic theory of gases, the first law of thermodynamics, and heat engines.
Unit 11 – Oscillations and Waves	HS-PS4-1	In this unit students learn about oscillations, Hooke's Law, simple harmonic motion, period and frequency, and energy in simple harmonic motion. They also learn about oscillation of pendulums, waves, wave properties, interference, standing waves, and the standing wave equation.
Unit 12 – Sound	HS-PS4-1	In this unit students learn about sound waves, sound properties, the speed of sound, and sound intensity. They also learn about string instruments, open pipes, closed pipes, and Doppler shift.
Unit 13 – Light	HS-PS4-1	In this unit students learn about light waves, color, the electromagnetic spectrum, and reflection. They also learn about index of refraction, refraction, internal refraction, dispersion, interference of light, diffraction grating, single slit diffraction, resolving power, thin films, and doppler shift of light.
Unit 14 – Optics		In this unit students learn about lenses and images, thin lens equation, ray tracing, a convex lens with a real image, magnification, and a convex lens with a virtual image. They also learn about concave lens, optics of the eye, mirror equation, and mirror with virtual image.
Unit 15 – Electric Forces		In this unit students learn about electric charges, Coulomb's Law, force from multiple charges, 2-D Coulomb's Law, electric field, and electric field with multiple charges. They also learn about electric field from charged plates, electric potential energy, electric potential, potential difference and E and V of charged plates.

Unit 16 – DC Electric Circuits	HS-PS4-2; HS-PS4-4	In this unit students learn about electric current and circuits, resistance and Ohm's Law, simple circuits, and electric power. They also learn about series and parallel, and series and parallel resistors. Also discussed are systems of resistors, capacitors, energy in capacitors, systems of capacitors, and DC versus AC.
Unit 17 – Magnetic Forces	HS-PS2-5; HS-PS3-3; HS-PS4-3	In this unit students learn about magnetic forces, magnetic fields, magnetic field from a current, from multiple wires, and from current loops, solenoids and electromagnets, and magnetic force on moving charges. Students also learn about the right hand rule, motion of charges in B field, magnetic force on a current, and magnetic force in parallel wires.
Unit 18 – Induction	HS-PS3-5	In this unit students learn about Induction, magnetic flux, and Faraday's Law. They also learn about Lenz's Law, generators, transformers, and electromagnetic waves.
Unit 19 – Atomic Physics	HS-PS2-6; HS-PS3-2	In this unit students learn about the structure of the atom and the photoelectric effect. They also learn about atomic spectra, the Bohr model, matter waves, and lasers.