

Wyoming Department of Education Required Virtual Education Course Syllabus

BIG HORN COUNTY SCHOOL DISTRICT #1

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| Program Name | WYCA | Content Area | Science |
| Course ID | CAOT79032 | Grade Level | 9, 10, 11, 12 |
| Course Name | Introductory Astronomy | # of Credits | 0.5 |
| SCED Code | 03004G0.5011 | Curriculum Type | Connections Academy |

COURSE DESCRIPTION

In this course the student will explore a broad range of astronomy topics, including the planetary system, stars, galaxies, and the universe. The student will also apply the scientific method and examine the evolution of scientific ideas. By the end of the course, the student will be able to:

- Assess the nature, scope, and evolution of the Universe
- Apply fundamental concepts underlying astronomy
- Evaluate the evolution of scientific ideas in astronomy
- Analyze data to determine patterns, relationships, perspectives, and credibility

WYOMING CONTENT AND PERFORMANCE STANDARDS

| STANDARD# | BENCHMARK |
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| 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-PS2-4 | 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-PS4-1 | Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. |
| HS-PS4-3 | 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-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. |
| HS-ESS1-1 | 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-ESS1-2 | 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-ESS1-3 | Communicate scientific ideas about the way stars, over their life cycle, produce elements. |
| HS-ESS1-4 | Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. |
| HS-ESS1-6 | Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. |
| HS-ESS2-3 | Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. |

SCOPE AND SEQUENCE

| UNIT OUTLINE | STANDARD# | OUTCOMES |
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| Lesson 1: Earth's Place in the Universe | HS-ESS1-2, HS-ESS1-4, HS-ESS1-6 | <ul style="list-style-type: none"> • Relate Earth's size and location to other objects in the solar system and within the universe • Describe how the celestial sphere and constellations are used to locate objects in the sky • Account for the apparent motion of the sun and stars and the changing appearance of the moon • Explain how Earth's tilt causes the seasons • Explain the cause of retrograde motion of planets and how distances in space are measured |
| Lesson 2: The History of Astronomy | HS-ESS1-3, HS-ESS1-4, HS-ESS1-6 | <ul style="list-style-type: none"> • Explain how ancient civilizations used astronomy to determine direction and keep time • Identify ancient Greek beliefs about the solar system • Compare and contrast the geocentric and heliocentric models of the solar system • Identify the main contributions of Copernicus, Brahe, Kepler, and Galileo to the field of astronomy • Analyze planetary motion using Kepler's laws of planetary motion |

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| Lesson 3: Scientific Methods in Astronomy | HS-ESS1-3, HS-ESS1-4, HS-ESS1-6 | <ul style="list-style-type: none"> •Distinguish between observations, experiments, hypotheses, and theories •Describe how scientists use scientific methods of observation and testing to understand the universe •Identify possible effects from measurement errors •Recognize the difference between scientific theory and nonscience |
| Lesson 4: Motion, Energy, and Gravity | HS-PS2-1, HS-PS2-2, HS-PS2-4 | <ul style="list-style-type: none"> •Relate Newton’s laws to Kepler’s laws of planetary motion •Apply Newton’s laws of motion to planetary motion •Understand that there is a gravitational force between any two objects with mass •Relate conservation laws to motion and energy in space •Describe how gravitational forces between the moon, the sun, and Earth cause tides |
| Lesson 5: Light, Matter, and Telescopes | HS-PS4-1, HS-PS4-3, HS-PS4-5, HS-ESS1-3 | <ul style="list-style-type: none"> •Relate the properties of electromagnetic radiation to the behavior of waves and particles, including how it is studied •Identify properties of matter in terms of its atoms, elements, and phases •Explain how to determine an object’s temperature and relative motion •Describe how spectra are used to determine the chemical composition of stars and galaxies •Explain how telescopes and other detector technologies are used to study light |
| Lesson 6: Our Solar System | HS-ESS1-6 | <ul style="list-style-type: none"> •Describe patterns of motion in the solar system including exceptions •List basic differences between terrestrial and Jovian planets •Summarize the theory of the formation of the solar system •Differentiate the formation of the terrestrial and Jovian planets •Explain how radioactive dating is used to determine the age of the solar system |
| Lesson 7: Terrestrial Surfaces and Interiors | HS-ESS2-3 | <ul style="list-style-type: none"> •Describe the interior of terrestrial planets, including heat sources and transfers •Identify the major geological processes that change the surface of terrestrial planets •Compare and contrast the surface of the terrestrial planets |
| Lesson 8: Terrestrial Atmospheres | HS-ESS1-6 | <ul style="list-style-type: none"> •Identify factors that cause planets to gain or lose atmospheres •Describe the greenhouse effect on the terrestrial planets •Compare and contrast the atmosphere on the terrestrial planets |
| Lesson 9: Jovian Planets | HS-ESS1-6 | <ul style="list-style-type: none"> •Compare and contrast the interior structures of Jovian planets •Describe similarities and differences in atmospheres of Jovian planets •Describe the geology of the moons of the Jovian planets •Identify the origins and compositions of the ring systems |
| Lesson 10: Smaller Objects in Solar System | HS-ESS1-6, HS-ESS1-4 | <ul style="list-style-type: none"> •Summarize orbital and physical properties of asteroids •Describe the composition and structure of comets •Explain how meteorites are related to asteroids and comets •Identify dwarf planets •Explain the collisions of small objects with planets |
| Lesson 11: Exosolar Planets | HS-ESS1-6 | <ul style="list-style-type: none"> •Explain the various methods used to detect exoplanets •Describe the characteristics of exosolar planets •Account for the discovery of hot Jupiter-like planets •Identify missions that discovered exosolar planets |

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| Lesson 12: A Star is Born | HS-ESS1-1, HS-ESS1-3 | <ul style="list-style-type: none"> • Summarize the formation of main-sequence stars • Explain how stellar distances are measured • Describe how the brightness of stars is determined • Relate a star's temperature to its color • Use an H-R diagram to identify stellar properties |
| Lesson 13: It's a Star's Life | HS-ESS1-3 | <ul style="list-style-type: none"> • Identify the characteristics for determining the life of a star • Describe the evolution of low-mass stars • Describe the evolution of high-mass stars • Identify the end products of a star's life |
| Lesson 14: The Milky Way | HS-ESS1-6 | <ul style="list-style-type: none"> • Analyze the early understanding of the Milky Way • Explain the appearance and structures within the Milky Way galaxy • Explain the components of interstellar medium • Identify the structures at the center of the galaxy |
| Lesson 15: Galaxies | HS-ESS1-6 | <ul style="list-style-type: none"> • Classify different types of galaxies • Explain how to use the distance ladder to measure galactic distances • Explain the discovery of the expanding universe • Explain how galaxies are formed |
| Lesson 16: The Big Bang Theory | HS-ESS1-2 | <ul style="list-style-type: none"> • Describe the evidence for the big bang theory |
| Lesson 17: Dark Matter and Energy | HS-ESS1-2 | <ul style="list-style-type: none"> • Explain the nature of dark matter and evidence for its existence • Identify how the amount of dark matter is measured • Describe the nature of dark energy and how its existence has been confirmed • Identify the three possible fates of the universe |