Seymour Public Schools Curriculum

Grade: 10-12 **Subject: Astronomy**

The purpose of this class is introduce students to Astronomy

Unit 1 – The Night Sky

Unit 2 – Telescopes and Astrophotography

Unit 3 – Earth in Space

Unit 4 – Our Solar System

Unit 5 – Physics of Astronomy

Unit 6 – Our Sun and Other Stars

Unit 7 – Galaxies and Cosmology

Seymour Public Schools Curriculum

UNIT 1- The Night Sky

Subject: **Grade:** **Time Frame:**	**Subject: Astronomy** **Grade: 10-12** **Approximately 7 - Periods (87 min)**
Next Generation Science Standards	**HS-ESS1** Earth's Place in the Universe **HS-ESS2** Earth's Systems
Enduring Understanding	The universe is an ever changing place of immense size and spectacular phenomena.
Essential Questions	• What are stars how do they move throughout the night? • What are planets and how do they move throughout the night? • What are constellations? • Why do we and did we observe the night sky?
Priority Standards	**(ESS1.A)** The Universe and Its Stars The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. **(ESS1.B)** Earth and the Solar System Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the earth. These phenomena cause a cycle of ice ages and other gradual climate changes.
Performance Expectations **(Student outcomes)**	**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-ESS1-6.** 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.

Strategies/Modes	**Materials/Resources**	**Assessments**
Demonstrate, model, and instruct in the use of mathematics to analyze data and make observation.	➢ computers ➢ rulers ➢ calculators ➢ colored pencils ➢ youtube (i.e. crashcourse - astronomy)	<u>Summative Assessment</u> Badge Tasks <u>Formative Assessments</u> comprehensive check questions (CCQs) observational activities construct a planisphere

Seymour Public Schools Curriculum

UNIT 2- Telescopes and Astrophotography

Subject: **Grade:** **Time Frame:**	**Subject: Astronomy** **Grade: 10-12** **Approximately 5 - Periods (87 min)**
Next Generation Science Standards	**HS-ESS1** Earth's Place in the Universe **HS-ESS2** Earth's Systems
Enduring Understanding	Telescopes and cameras are an integral part in studying Astronomy
Essential Questions	• What are the three major types of optical telescopes? • How do optical telescopes work? • What the other types of telescopes? • Why do we use cameras?
Priority Standards	**(PS4.A) Wave Properties**. Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave
Performance Expectations **(Student outcomes)**	**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-PS4-5**. 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.

Strategies/Modes	**Materials/Resources**	**Assessments**
Demonstrate, model, and instruct in the use of mathematics to analyze data and make observation.	➢ computers ➢ rulers ➢ calculators ➢ colored pencils ➢ youtube (i.e. crashcourse - astronomy)	<u>Summative Assessment</u> Badge Tasks <u>Formative Assessments</u> comprehensive check questions (CCQs) observational activities telescope checklist

Seymour Public Schools Curriculum

UNIT 3- Earth in Space

Subject: **Grade:** **Time Frame:**	**Subject: Astronomy** **Grade: 10-12** **Approximately 6 - Periods (87 min)**
Next Generation Science Standards	**HS-ESS1** Earth's Place in the Universe **HS-ESS2** Earth's Systems
Enduring Understanding	Earth is a dynamic planet and the only place known to humans that can sustain life.
Essential Questions	• How old is Earth and how do we know this? • What causes the seasons? • How does the moon interact with Earth? • Why are there so many different calendars?
Priority Standards	**(ESS1.B)** Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system. **(ESS1.C)** Continental rocks, which can be older than 4 billion years, are generally much older than the rocks of the ocean floor, which are less than 200 million years old. **(ESS1.C)** Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history.
Performance Expectations **(Student outcomes)**	**(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 material, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.

Strategies/Modes	**Materials/Resources**	**Assessments**
Demonstrate, model, and instruct in the use of mathematics to analyze data and make observation.	➢ computers ➢ rulers ➢ calculators ➢ colored pencils ➢ youtube (i.e. crashcourse - astronomy)	<u>Summative Assessment</u> Badge Tasks <u>Formative Assessments</u> comprehensive check questions (CCQs) observational activities

Seymour Public Schools Curriculum

UNIT 4- Our Solar System

Subject: **Grade:** **Time Frame:**	**Subject: Astronomy** **Grade: 10-12** **Approximately 9 - Periods (87 min)**
Next Generation Science Standards	**HS-ESS1** Earth's Place in the Universe **HS-ESS2** Earth's Systems
Enduring Understanding	Humans explore the planets, sun and moons to learn about the history future, and nature of the solar system, its planets and life.
Essential Questions	• What objects are in our solar system? • What is considered the edge of our solar system? • What scientists were involved with modeling our solar system? • How did our solar system form?
Priority Standards	**(ESS1.B)** Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system. **(ESS1.C)** Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history.
Performance Expectations **(Student outcomes)**	**(HS-ESS1-2)** Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. **(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-ESS1-3)** 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 material, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.

Strategies/Modes	**Materials/Resources**	**Assessments**
Demonstrate, model, and instruct in the use of mathematics to analyze data and make observation.	➢ computers ➢ rulers ➢ calculators ➢ colored pencils ➢ youtube (i.e. crashcourse - astronomy)	<u>Summative Assessment</u> Badge Tasks <u>Formative Assessments</u> comprehensive check questions (CCQs) observational activities

Seymour Public Schools Curriculum

UNIT 5- Physics of Astronomy

Subject: **Grade:** **Time Frame:**	**Subject: Astronomy** **Grade: 10-12** **Approximately 5 - Periods (87 min)**
Next Generation Science Standards	**HS-ESS1** Earth's Place in the Universe **HS-ESS2** Earth's Systems
Enduring Understanding	Physics is the key to understanding Astronomy
Essential Questions	• Why is gravity fundamental to the study of astronomy? • What is classical relativity? • What scientists were involved relativity? • How is time associated with gravity?
Priority Standards	**(PS2.A)** Newton's second law accurately predicts changes in the motion of macroscopic objects. (HS-PS2-1) **(PS2.B)** Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. (HS-PS2-4)
Performance Expectations **(Student outcomes)**	**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-PS2-3**. 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 of Newton's Law of Gravitation to describe and predict the gravitational between objects.

Strategies/Modes	**Materials/Resources**	**Assessments**
Demonstrate, model, and instruct in the use of mathematics to analyze data and make observation.	➢ computers ➢ rulers ➢ calculators ➢ colored pencils ➢ youtube (i.e. crashcourse - astronomy)	<u>Summative Assessment</u> Badge Tasks <u>Formative Assessments</u> comprehensive check questions (CCQs) observational activities

Seymour Public Schools Curriculum

UNIT 6- Our Sun and Other Stars

Subject: **Grade:** **Time Frame:**	**Subject: Astronomy** **Grade: 10-12** **Approximately 6 - Periods (87 min)**
Next Generation Science Standards	**HS-ESS1** Earth's Place in the Universe **HS-ESS2** Earth's Systems
Enduring Understanding	Every little point we see at night is a star. They make up the majority of the mass of the universe.
Essential Questions	• How long will our sun shine? • How does our sun compare with other stars? • How many stars are in the universe? • What happens when stars die?
Priority Standards	**(ESS1.A)** The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. (HS-ESS1-1). The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. (HS-ESS1-2),(HS-ESS1-3). Other than the hydrogen and helium formed at the time of the Big Bang, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode. (HS-ESS1-2), (HS-ESS1-3)
Performance Expectations **(Student outcomes)**	**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-ESS1-6.** 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.

Strategies/Modes	**Materials/Resources**	**Assessments**
Demonstrate, model, and instruct in the use of mathematics to analyze data and make observation.	➢ computers ➢ rulers ➢ calculators ➢ colored pencils ➢ youtube (i.e. crashcourse - astronomy)	<u>Summative Assessment</u> Badge Tasks <u>Formative Assessments</u> comprehensive check questions (CCQs) observational activities

Seymour Public Schools Curriculum

UNIT 6- Galaxies and Cosmology

Subject: **Grade:** **Time Frame:**	**Subject: Astronomy** **Grade: 10-12** **Approximately 5 - Periods (87 min)**
Next Generation Science Standards	**HS-ESS1** Earth's Place in the Universe **HS-ESS2** Earth's Systems
Enduring Understanding	Galaxies represent the structure of the universe.
Essential Questions	• How big is the Milky Way and how does it compare with other galaxies? • What are the three major types of galaxies? • How do we know that galaxies are moving away from each other? • What evidence is there for the Big Bang theory?
Priority Standards	**((ESS1.A)** The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. (HS-ESS1-1). The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. (HS-ESS1-2),(HS-ESS1-3). Other than the hydrogen and helium formed at the time of the Big Bang, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode. (HS-ESS1-2), (HS-ESS1-3)
Performance Expectations **(Student outcomes)**	**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

Strategies/Modes	**Materials/Resources**	**Assessments**
Demonstrate, model, and instruct in the use of mathematics to analyze data and make observation.	➢ computers ➢ rulers ➢ calculators ➢ colored pencils ➢ youtube (i.e. crashcourse - astronomy)	<u>Summative Assessment</u> Badge Tasks <u>Formative Assessments</u> comprehensive check questions (CCQs) observational activities