Astronomy is an elective course which provides a broad survey of the field of astronomy in one semester of study. The course is designed to have a minimum of mathematical investigation and to be accessible to a diverse population. The project-based course is easily differentiated for students with a variety of educational needs. Astronomical investigations are highlighted from ancient peoples to the most modern methods, which are explored with the internet and other resources.
This one semester course provides the opportunity to develop knowledge and understanding about the solar system, galaxy, and universe in which we live. Much attention is given to an appreciation for how we have obtained this information about the universe. Students use tools of observation to learn about space and learn how other astronomers past and present have used tools available. Areas of study include: the process of science, including use of the tools used to observe the sky; stellar astronomy and how stars change over time; and planetary astronomy and how interstellar spacecraft are obtaining information about other bodies in the solar system.

CURRICULUM MAP for ASTRONOMY SEMESTER COURSE

TIMELINE	Notes	SKILLS
2.5 – 3 weeks	**Students will explain the tools used by astronomers to study electromagnetic radiation to determine composition, motions, and other physical attributes of astronomical objects.**	a. Explain the challenges faced by astronomers due to the properties of light and the vast distances in the cosmos. b. Evaluate the types of telescopes used by astronomers for examining different frequencies of electromagnetic radiation and compare and contrast the uses and advantages of each (e.g. radio, visible, gamma ray, reflector, and refractor). c. Mathematically apply Newtonian gravity to celestial bodies to determine their masses and explain their motion (e.g. Kepler's Laws) d. Discuss how spectroscopy provides information about the inherent properties and motions of objects. e. Quantitatively analyze data from telescopes (e.g. spectra, multi-wavelength photometry, and images) and/or other astronomical sources (e.g. tide tables, sky charts).
2.5 – 3 weeks	**Students will describe the scientific view of the origin of the universe, the evolution of matter and the development of resulting celestial objects.**	a. Outline the main arguments and evidence in support of the standard cosmological model. (e.g. elements, solar systems, and universe) b. Describe the life cycle of a star and explain the role gravity and mass play in the brightness, life span, and end-stages of stars. c. Compare and contrast the major properties of the components of our solar system.

4 weeks	**Students will describe and explain the celestial sphere and astronomical observations made from the point of reference of the Earth.**	a. Evaluate the effects of the relative positions of the Earth, moon, and sun on observable phenomena, e.g. phases of the moon, eclipses, seasons, and diurnal cycles. b. Describe how latitude and time of the year affect visibility of constellations. c. Predict visibility of planets (major and minor) in the solar system based on relative orbital motion.
3 weeks	**Students analyze the dynamic nature of astronomy by comparing and contrasting evidence supporting current views of the universe with historical views.**	a. Evaluate the impact that technological advances, as an agent of change, have had on our modern view of the solar system and universe. b. Explain the relevance of experimental contributions of scientists to the advancement of the field of astronomy.
2 weeks	**Students will evaluate the significance of energy transfers and energy transformations in understanding the universe.**	a. Relate nuclear fusion reactions and mass-energy equivalence to the life cycle of stars. b. Explain the relationship between the energy produced by fusion in stars to the luminosity. c. Analyze the energy relationships between the mass, power output, and life span of stars. d. Describe energy transfers and transformations associated with the motion and interactions of celestial bodies (e.g. orbits, binary pulsars, meteors, black holes, and galaxy mergers).
2 weeks	**Students will explore connections between cosmic phenomena and conditions necessary for life.**	a. Characterize the habitable zone in solar systems and habitable planetary bodies in our own and other solar systems. b. Describe the tools and techniques used to identify extrasolar planets and explore extrasolar planetary atmospheres. c. Describe signatures of life on other worlds and early Earth. d. Explain how astronomical hazards and global atmospheric changes have impacted the evolution of life on Earth.
1 week	**All standards to review for Final**	

Content Area: Science - High School Astronomy

Standard: Earth Systems Science

Describe and interpret how Earth's geologic history and place in space are relevant to our understanding of the processes that have shaped our planet

GRADE LEVEL EXPECTATION
Concepts and skills students master:

1. Describe the observations of the day and night sky used from ancient times to present.

Evidence Outcomes	**21st Century Skills and Readiness Competencies**
Students can: a. Describes how relative positions and motions can explain the seasons, length of days and years on a planet, lunar and solar eclipses on Earth and lunar phases. b. Describe the reason that the appearance of the night sky and positions of the stars changes at different times.	**Inquiry Questions:** 1. What causes different seasons in different parts of the world? 2. What causes lunar and solar eclipses and why do they occur in different parts of the world? 3. What is the relationship between the positions and motions of the Sun and Earth and the days and years we experience on the Earth? 4. Why do we see different stars at different times of the night or times during the year or positions on the Earth?
	Relevance and Application: 1. Different types of observing tools, including the human eye and a variety of telescopes have given us data about the Universe, galaxy, and solar system.

	Nature of Discipline: 1. Record qualitative and quantitative observations 2. Critically evaluate scientific claims in popular media and by peers, and determine if evidence presented is appropriate and sufficient to support the claims. 3. Select and use appropriate technologies to gather, process and analyze data

Content Area: Science - High School Astrology

Standard: Earth Systems Science

Describe and interpret how Earth's geologic history and place in space are relevant to our understanding of the processes that have shaped our planet

GRADE LEVEL EXPECTATION
Concepts and skills students master:

Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: a. Identifies the source of energy within the Sun and explains that the Sun provides most of Earth's energy in a variety of types of electromagnetic radiation. b. Describes nuclear reactions in stars and the processes that create heavier elements within stars. c. Develop, communicate, and	**Inquiry Questions:** 1. What causes the Sun to shine and supply sufficient energy for the Earth to sustain life? 2. How does the electromagnetic spectrum positively and negatively impact Earth's systems? 3. Where did all the known elements of the Universe come from? 4. How do stars change over time and why?

justify an evidence-based scientific explanation addressing questions around the extraterrestrial forces and energies that influence Earth d. Use specific equipment, technology, and resources such as satellite imagery, global positioning systems (GPS), global information systems (GIS), telescopes, video and image libraries, and computers to explore the universe)	**Relevance and Application:** 1. Fusion is the most common source of energy in the universe, and it provides the basis of Earth's energy through fusion reactions in the Sun. 2. Different types of telescopes have given us data about the universe, galaxy, and solar system. **Nature of Discipline:** 1. Understand the physical laws that govern Earth are the same physical laws that govern the rest of the universe. 2. Describes different methods used to investigate scientific questions (for example: constructing and interpreting models and researching scientific sources) 3. Critically evaluate strengths and weaknesses of a model which represents complex natural phenomena.