Astronomy Course Syllabus

Course Description:

In Astronomy, students will learn the fundamentals of the science of Astronomy, including its history. Students will learn about the types and tools of Astronomy, space exploration, and will be given an in-depth introduction to the solar system. Students will learn the characteristics of each of the planets in our solar system, and will learn to identify the stars, as seen from earth. Students will also be introduced to stars and spectroscopy, as well as galaxies. The topic of astrobiology will be taught, as well as an introduction into the idea of the search for life in our solar system, and students will learn about space, the interstellar medium, and its properties. Students will also learn about exotic objects and phenomena, like supernovae and black holes, and will learn the characteristics of our universe.

Part 1: 5 credit hours

Part 2: 5 credit hours

Course Outline

Unit 1: The Science of Astronomy

1.1 What is Astronomy?
1.2 Ancient Roots of Astronomy
1.3 The History of Astronomy
1.4 Naked Eye Observations

California Standards

In this Unit students will learn:
What Astronomy is, its ancient beginnings, and a brief history of Astronomy.
To make some naked eye observations.
[Earth Sciences: 1a, 2b]

Unit 2: Types and Tools of Astronomy

2.1 History of the Telescope
2.2 How Telescopes Work
2.3 Radio Astronomy

In this Unit students will learn:
The varying types of Astronomy and the different tools used in the science.
The history of the telescope, how they work, and how they have developed over time.
The practice of radio Astronomy.
[Earth Sciences: 1e, 1g, 2b, 2c, 2d, 2f, 2g]

Unit 3: Space Exploration

3.1 A Brief History of Space Exploration
3.2 Voyager 1
3.3 The Future of Human Space Exploration
3.4 The Challenges of Interstellar Travel

In this Unit students will learn:
A brief overview of the history of space exploration, including Voyage 1.
The potential future of human space exploration, and the challenges of interstellar travel.

Unit 4: Introduction to the Solar System

4.1 Formation of the Solar System
4.2 How the Earth Orbits the Sun
4.3 Dwarf Planets and The Pluto Dilemma
4.4 The Asteroid Belt
4.5 Comets and the Oort Cloud
4.6 Size Comparisons of Celestial Bodies

In this Unit students will learn:
About our Solar System, including its formation.
How the earth orbits the Sun, and the path it takes.
About dwarf planets and the Pluto dilemma.
About the asteroid belt, comets, and the Oort cloud.
The differences in sizes of celestial bodies.
[Earth Sciences:1a, 1b, 1c,1d, 1e, 2a, 2b, 2c, 2d]

Unit 5: Solar System: The Planets

5.1 Mercury
5.2 Venus
5.3 Earth and Moon
5.4 Mars
5.5 Jupiter
5.6 Saturn
5.7 Uranus
5.8 Neptune

In this Unit students will learn:
About the solar system and the planets, including Mercury, Venus, Earth and the Moon, Mars, Jupiter, Saturn, Uranus, and Neptune.
[Earth Sciences: 1a, 1b, 1c, 1d, 1e, 2a, 2c]

Unit 6: The stars as Seen from Earth

6.1 Star Charts
6.2 Celestial Coordinate Systems
6.3 Stellar Magnitudes
6.4 Measuring Distances to Stars
6.5 Messier Catalog

In this Unit students will learn:
To view the stars from the perspective of Earth, and how to interpret star charts.
The celestial coordinate systems and stellar magnitudes.
To measure distances to stars.
About the Messier catalog.
[Earth Sciences:1g, 2b, 2d, 2f]

Unit 7: Stars and Spectroscopy

7.1 What are Stars?
7.2 Stellar Evolution
7.3 Stellar Classification
7.4 The Hertzsprung-Russell (H-R) Diagram
7.5 Binary Star Systems
7.6 Star Clusters

In this Unit students will learn:
The basics of stars and spectroscopy, including what stars are and stellar evolution.
To classify stars, and the Hertzsprung-Russell Diagram.
About binary star systems and star clusters.
[Earth Sciences: 1e, 1g, 2b, 2d, 2e, 2f]

Unit 8: Galaxies

8.1 Galaxy Types and Classification
8.2 The Milky Way Galaxy and Laniakea Supercluster
8.3 Hubble Deep Field and Ultra Deep Field
8.4 Galactic Collisions

In this Unit students will learn:
The basics of galaxies, including their types and classifications. The Milky Way galaxy and the Lanaiakea Supercluster.
About the Hubble deep field and ultra deep field, and about galactic collisions.
[Earth Sciences: 1g, 2a, 2b]

Unit 9: Astrobiology and the Search for Life in the Solar System

9.1 What is Astrobiology?
9.2 The Search for Life in the Solar System: Europa
9.3 The Search for Life in the Solar System: Enceladus

In this Unit students will learn:
About astrobiology and the status of the search for life in the solar system.
About Europa and Enceladus, and their potential for harboring the existence of life.
[Earth Sciences: 1g, 2b]

Unit 10: The Search for Life Elsewhere

10.1 The Drake Equation
10.2 Exoplanets
10.3 Methods of Detecting Exoplanets

In this Unit students will learn:
More about the search for life, and the Drake equation.
About exoplanets, and methods for detecting them.
[Earth Sciences: 1g, 2b]

Unit 11: Space and its Properties

11.1 The Interstellar Medium
11.2 Principles of Spacetime: A Very Basic Introduction to Einstein's Relativity
11.3 Dark Matter and Dark Energy
11.4 Cutting Edge Science: The Higgs Field and Elementary Particles

In this Unit students will learn:
The properties of space and interstellar medium.
About the principles of Einstein's theory of relativity, and the of Spacetime.
About dark matter and dark energy.
The Higgs Field about elementary particles.
[Earth Sciences: 2c, 2d, 2e, 2f, 2g]

Unit 12: Exotic Objects and Phenomena

12.1 Supernovae
12.2 Neutron Stars
12.3 Journey into a Black Hole
12.4 Black Holes and Quasars

In this Unit students will learn:
About exotic objects and phenomena, including supernovae, neutron stars, black holes, and quasars.
[Earth Sciences: 2b, 2c, 2d, 2e, 2f, 2g]

Unit 13: The Universe

13.1 The Beginning of the Universe
13.2 The Expanding Universe
13.3 Misconceptions About the Universe
13.4 The Accelerating Universe
13.5 The Three Fates of the Universe

In this Unit students will learn:
Key characteristics of the universe, including how it began and how it continues to expand.
Common misconceptions about the universe.
That the universe is accelerating, and the three potential fates of the universe.
[Earth Sciences: 2c, 2d, 2e, 2g]