Florida Department of Education

COURSE DESCRIPTION - GRADES 9-12, ADULT

Subject Area: Science
Course Number: 2001350
Course Title: Astronomy Solar/Galactic
Credit: 1.0
Will meet graduation requirements for Science

A. Major Concepts/Content. The purpose of this course is to enable students to develop and apply knowledge of the universe and compare the conditions, properties, and motions of bodies in space. Emphasis shall be placed on concepts basic to Earth, including materials, processes, history, and the environment.

The content should include, but not be limited to, the following:

- implementation of scientific habits of mind
- application of scientific knowledge, methodology, and historical context to solve problems
- use of laboratory technologies
- terminology
- historical developments from ancient cultures to the present
- instruments for collection of astronomical data
- celestial sphere
- ascension and declination
- planets, asteroids, and comets
- effects of the motions of the Earth
- effects of the Earth-Moon system
- the sun
- astronomical measurements
- stars
- cosmology
- connections between astronomy, technology, and society
- space flight and exobiology

This course shall integrate the Goal 3 Student Performance Standards of the Florida System of School Improvement and Accountability as appropriate to the content and processes of the subject matter.

Course student performance standards must be adopted by the district, and they must reflect appropriate Sunshine State Standards benchmarks.

B. **Special Note.** Laboratory investigations of selected topics in the content to foster inquiry should include use of the scientific method, measurement, laboratory apparatus, and safety procedures as an integral part of this course. Use of satellite imagery, image-processing techniques, model development with behavior-over-time graphs, and night telescopic observations are encouraged.

Students earning credit in 2001350 - Astronomy Solar/Galactic may not earn credit in 202091A - Astronomy Solar/Galactic Honors.

C. **Course Requirements.** These requirements include, but are not limited to, the benchmarks from the Sunshine State Standards that are most relevant to this course. Benchmarks correlated with a specific course requirement may also be addressed by other course requirements as appropriate. Some requirements in this course are not addressed in the Sunshine State Standards.

Benchmarks from Science, Strand H, should not be taught and assessed in isolation, but should be combined with other benchmarks identified in this course description.

After successfully completing this course, the student will:

1. Demonstrate effective implementation of scientific habits of mind.

2. Apply knowledge of the nature of science, scientific methodology, and historical context to solve problems, and employ safe and effective use of laboratory technologies.

SC.H.1.4.1 know that investigations are conducted to explore new phenomena, to check on previous results, to test how well a theory predicts, and to compare different theories.

SC.H.1.4.2	know that from time to time, major shifts occur in the scientific view of how the world works, but that more often the changes that take place in the body of scientific knowledge are small modifications of prior knowledge.
SC.H.1.4.3	understand that no matter how well one theory fits observations, a new theory might fit them as well or better, or might fit a wider range of observations, because in science, the testing, revising, and occasional discarding of theories, new and old, never ends and leads to an increasingly better understanding of how things work in the world, but not to absolute truth.
SC.H.1.4.4	know that scientists in any one research group tend to see things alike and that therefore scientific teams are expected to seek out the possible sources of bias in the design of their investigations and in their data analysis.
SC.H.1.4.5	understand that new ideas in science are limited by the context in which they are conceived, are often rejected by the scientific establishment, sometimes spring from unexpected findings, and usually grow slowly from many contributors.
SC.H.1.4.6	understand that, in the short run, new ideas that do not mesh well with mainstream ideas in science often encounter vigorous criticism and that, in the long run, theories are judged by how they fit with other theories, the range of observations they explain, how well they explain observations, and how effective they are in predicting new findings.
SC.H.1.4.7	understand the importance of a sense of responsibility, a commitment to peer review, truthful reporting of the methods and outcomes of investigations, and making the public aware of the findings.
SC.H.2.4.1	know that scientists assume that the universe is a vast system in which basic rules exist that may range from very simple to extremely complex, but that scientists operate on the belief that the rules can be discovered by careful, systemic study.

SC.H.2.4.2 know that scientists control conditions in order to obtain evidence, but when that is not possible for practical or ethical reasons, they try to observe a wide range of natural occurrences to discern patterns.

3. Demonstrate use of relevant terminology.

4. Demonstrate knowledge of the historical development of astronomy from monuments and concepts of ancient cultures through competing ideas of Renaissance astronomers (e.g., Copernicus, Galileo, Kepler, Newton) to the present.

SC.C.2.4.6 explain that all forces come in pairs commonly called action and reaction.

SC.H.3.4.5 know that the value of a technology may differ for different people and at different times.

5. Demonstrate awareness of the function of various astronomical instruments for gathering and analyzing data across the electromagnetic spectrum (e.g., observatories, satellites, space probes).

SC.A.2.4.6 understand that matter may act as a wave, a particle, or something else entirely different with its own characteristic behavior.

SC.B.1.4.4 know that as electrical charges oscillate, they create time-varying electric and magnetic fields that propagate away from the source as an electromagnetic wave.

SC.C.2.4.3 describe how magnetic force and electrical force are two aspects of a single force.

SC.E.2.4.6 know the various ways in which scientists collect and generate data about our universe (e.g., X-ray telescopes, computer simulations of gravitational systems, nuclear reactions, space probes, and supercollider simulations).

SC.E.2.4.7 know that mathematical models and computer simulations are used in studying evidence from many sources to form a scientific account of the universe.

SC.H.3.4.1 know that performance testing is often conducted using small-scale models, computer simulations, or analogous systems to reduce the chance of system failure.

6. Identify parts of the celestial sphere and the associated concepts of night ascension and declination.

7. Compare and contrast various members of the solar system, including planets, asteroids, and comets.

SC.C.2.4.1 know that acceleration due to gravitational force is proportional to mass and inversely proportional to the square of the distance between the objects.

SC.E.1.4.2 know how the characteristics of other planets and satellites are similar to and different from those of the Earth.

8. Explain how motions of the Earth affect our concepts of time, distance, and direction.

SC.C.1.4.1 know that all motion is relative to whatever frame of reference is chosen and that there is no absolute frame of reference from which to observe all motion.

SC.D.1.4.1 know how climatic patterns on Earth result from an interplay of many factors (Earth's topography, its rotation on its axis, solar radiation, the transfer of heat energy where the atmosphere interfaces with lands and oceans, and wind and ocean currents).

9. Explain the effects of the Earth-Moon system, including lunar phases, eclipses, and tides.

SC.E.1.4.1 understand the relationships between events on Earth and the movements of the Earth, its moon, the other planets, and the sun.

10. Identify various phenomena of the sun, including surface features, sunspot cycle, internal layers, and energy production.

SC.A.2.4.4 know that nuclear energy is released when small, light atoms are fused into heavier ones.

SC.C.2.4.4 know that the forces that hold the nucleus of an atom together are much stronger than electromagnetic force and that this is the reason for the great amount of energy released from the nuclear reactions in the sun and other stars.

11. Demonstrate knowledge of astronomical measurements, including distance units, parallax, magnitude, and Doppler shift.

SC.B.1.4.3 know that temperature is a measure of the average translational kinetic energy of motion of the molecules in an object.

SC.C.1.4.2 know that any change in velocity is an acceleration.

SC.E.2.4.3 know astronomical distance and time.

12. Describe the motions, spectral classifications, groupings, and life cycles of stars.

SC.E.2.4.1 know that the stages in the development of three categories of stars are based on mass: stars that have the approximate mass of our sun, stars that are two- to three-stellar masses and develop into neutron stars, and stars that are five- to six-stellar masses and develop into black holes.

SC.E.2.4.2 identify the arrangement of bodies found within and outside our galaxy.

SC.E.2.4.4 understand stellar equilibrium.

13. Demonstrate awareness of the age, size, structure, and expansion of the universe.

SC.B.2.4.1 know that the structure of the universe is the result of interactions involving fundamental particles (matter) and basic forces (energy) and that evidence suggests that the universe contains all of the matter and energy that ever existed.

SC.E.2.4.5 know various scientific theories on how the universe was formed.

14. Demonstrate knowledge of the connections of astronomy with technology and society.

SC.H.3.4.2 know that technological problems often create a demand for new scientific knowledge and that new technologies make it possible for scientists to extend their research in a way that advances science.

SC.H.3.4.3 know that scientists can bring information, insights, and analytical skills to matters of public concern and help people understand the possible causes and effects of events.

SC.H.3.4.4 know that funds for science research come from federal government agencies, industry, and private foundations and that this funding often influences the areas of discovery.

SC.H.3.4.6 know that scientific knowledge is used by those who engage in design and technology to solve practical problems, taking human values and limitations into account.

15. Demonstrate awareness of efforts by the scientific community to investigate the possible existence of exobiological life (e.g., National Aeronautics and Space Administration (NASA), Search for Extraterrestrial Intelligence (SETI)).

SC.E.1.4.3 know the various reasons that Earth is the only planet in our Solar System that appears to be capable of supporting life as we know it.