International School

COURSE DESCRIPTION – 9th Grade

Subject Area: Science
Course Title: Earth Science
Professor: Mr. Jose L. Melendez
Course Length: 1 year

Objective: The purpose of this course is to provide a full understanding of the planet Earth and its major disciplines, which include geology, geography, geophysics, and geodesy.

A. Major Concepts/Content. The purpose of this course is to develop and apply concepts basic to the Earth, its materials, processes, history, and environment in space. The content should include, but not be limited to, the following:

-The nature of science -the universe and the solar system

-The developmental cycle of stars

-The earth-moon system -space exploration

-Formation of igneous, sedimentary, and metamorphic rocks and identification and classification of rocks and minerals

-Geological divisions of the earth

-Formation of land forms and basic mountain types

-Fundamentals of plate tectonics

-Formation of rivers and water systems

-Glaciers

-Hydrologic cycle

-Physical oceanography

-Meteorology, including development of hazardous weather, weather mapping, weather systems, frontal development, and satellite imagery

-Types of soils and erosion -renewable and nonrenewable energy resources

B. Special Note. Laboratory investigations of selected topics in the content, which include the use of scientific methods, measurement, laboratory apparatus, and safety procedures, are an integral part of this course. Use of satellite imagery, image processing techniques, and model development with behavior-over-time

graphs are strongly recommended.

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.

After successfully completing this course, the student will:

1. Use scientific methods to solve problems and demonstrate safe and effective use of laboratory instruments.

- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.

- 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.

2. Contrast scientific theories of the formation of the universe and the solar system

- Know that the structure of the universe is the result of interactions, fundamental particles (matter) and basic forces (energy) and that the evidence suggests that the universe contains all the matter and energy that ever existed.
- Know that acceleration due to gravitational force is proportional to mass and inversely proportional to the square of the distance between the objects.
- Identify the arrangement of bodies found within and outside our galaxy.
- Know astronomical distance and time.
- Understand stellar equilibrium.
- Know various scientific theories on how the universe was formed.
- 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).
- Know that mathematical models and computer simulations are used in studying evidence from many sources to form a scientific account of the universe.
- 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.
- 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. Describe the developmental cycles of stars.

- 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

4. Analyze earth, moon, and sun relationships as they apply to time and seasons.

- Understand the relationships between events on Earth and the movements of the Earth, its Moon, the other planets, and the Sun.
- Know how the characteristics of other planets and satellites are similar to and different from those of the Earth.
- 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.

5. Identify and classify different rocks and minerals.

- Know that the vast diversity of the properties of materials is primarily due to variations in the forces that hold molecules together.
- Know that connections (bonds) form between substances when outer-shell electrons are either transferred or shared between their atoms, changing the properties of substances.
- Know that changes in Earth's climate, geological activity, and life forms may be traced and compared.

6. Describe crustal movements and their effects, the formation of land masses, and basic mountain types.

- Know that the solid crust of Earth consists of slow-moving, separate plates that float on a denser, molten layer of Earth and that these plates interact with each other, changing the Earth's surface in many ways (e.g., forming mountain ranges and rift valleys, causing earthquake and volcanic activity, and forming undersea mountains that can become ocean islands).

7. Describe the changes that occur over time in different Earth system processes.

- Know that changes in Earth's climate, geological activity, and life forms may be traced and compared.
- Know that Earth's systems and organisms are the result of a long, continuous change over time.
- Knows that layers of energy-rich organic materials have gradually turned into great coal beds and oil pools (fossil fuels) by the pressure of the overlying earth and that humans burn fossil fuels to release the stored energy as heat and carbon dioxide.
- Know the ways in which humans today are placing their environmental support systems at risk (e.g., rapid human population growth, environmental degradation, and resource depletion).

8. Describe and interpret types of erosion with emphasis on soil types, glaciations, ocean currents, and weather patterns.

- Understand how knowledge of energy is fundamental to all the scientific disciplines (e.g., the energy required for biological processes in living organisms and the energy required for the building, erosion, and rebuilding of the Earth).
- 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).
- Know that changes in Earth's climate, geological activity, and life forms may be traced and compared.

9. Assess renewable and nonrenewable earth resources.

- Know that layers of energy-rich organic materials have been gradually turned into great coal beds and oil pools (fossil fuels) by the pressure of the overlying earth and that humans burn fossil fuels to release the stored energy as heat and carbon dioxide.
- Know that changes in a component of an ecosystem will have unpredictable effects on the entire system but that the components of the system tend to react in a way that will restore the ecosystem to its original condition.

10. Interpret and develop topographic, geologic, and weather maps.

- Know that changes in Earth's climate, geological activity, and life forms may be traced and compared.

11. Describe how the earth/space sciences interact with technology and society.

- Understand the interconnectedness of the systems on Earth and the quality of life.
- Know that the world ecosystems are shaped by physical factors that limit their productivity.
- Know that performance testing is often conducted using small-scale models, computer simulations, or analogous systems to reduce the chance of system failure.
- 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.
- 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.

- 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.
- Know that the value of a technology may differ for different people and at different times.
- 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.