

Course Title:	EARTH & SPACE SCIENCES
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Cycle/Division:	High School
Grade Level:	Grade 9
Credit Unit:	1
Duration:	2 semesters / 5 periods per week

Department's Vision:	Create Innovators who can link to life, with scientific understanding and learning.
Department's Mission:	Provide students with the proper knowledge, skills and scientific principles through hands on activities, research and experimentations, and thus creating young innovators who are ready for real life challenges and problem solving.

COURSE DESCRIPTION:

This course encompasses the geology, chemistry, and physics of our planet. Topics include formation, universe, solar system, evolution, structure, and composition of the Earth, plate tectonics and the rock cycle, the water cycle, causes and consequences of earthquakes, classifying earthquakes, measurement and prediction, and volcanoes. The laboratory work is based on research and application with a term lab theoretical and practical assessment.

General Skills:

Evaluation skills: making judgment about knowledge by introducing new text to solve and tackle problems using the related knowledge taught.

Comprehension: given scientific text or diagrams to analyze and answer questions about, summarize, compare, relate, or experiment...

Communication and social skills: Making movies, ppt., projects, interviews, and presenting the work either individually or with a peer or as a group.

Investigative skills: lab work, research, journals, experimentation...

Mathematical skills: related to investigations in the lab and application in projects.

Technological skills used in science and computer labs.

Knowledge skills: list, define, show, demonstrate, invent, relate etc... using the taught concepts.

GENERAL COURSE LEARNING OBJECTIVES:

1. Classify minerals by comparing observations and information about specific minerals with various schemes.
2. Analyze Systems and system processes within the rock cycle and construct an explanation for how energy and matter interact through the rock cycle.
3. Explain the origin of the solar system, describe the characteristics of the solar system, and analyze evidence to make inferences about Earth's formation and early history.
4. Describe the motion of orbiting bodies, explain Kepler's law of motion, and explain Newton's law of gravity.
5. Explain how the solar energy interact with the Earth' s systems, including how the distribution of solar energy and solar variability control Earth's climate over millennial to decades timescale.
6. Apply concepts of remote observations of temperature, composition, and motion to learn about objects in space.
7. Model and describe major stages of star's life cycle, how stars release energy and produce elements, and how stars nebulas cycle elements in space.
8. Construct explanations about the magnitude of sizes of and distance between objects in the universe s ell as about patterns found throughout the universe.
9. Construct explanations of the multiple lines of evidence that support the big bang theory and describe how these lines of evidence are connected to different aspects of the big bang model.
10. Introduce the complexity of the Earth's layers. Identify ways to observe ways to observe Earth's crust, characterize the mantle layer of the Earth, and describe its phenomena and composition.
11. Describe the Earth's core and its properties, show the dynamic nature of Earth's core, explain the process of the mantle convection, and describe the characteristics of the lithosphere.
12. Develop models of geologic structure produced by plate tectonics and evaluate causes and effects of Earth's crustal movement.
13. Identify the characteristics of divergent, convergent and transform boundaries and how different types of plates interact and to explain the processes of mantle convection, slab pull and ridge- push.
14. Understand how physical characteristics and geographic conditions give rise to varying types of volcanic structures and activity as well as varying degrees of earthquakes.
15. Explore how external energy and gravity drives processes at different scale of time, space, and quantity.
16. Explain the process that break down rock and scales at which they operate.



17. Model different ways material is move down and across Earth's surface and compare and contrast the ways material is deposited and how soil develops and change.
18. Model fossil formation and describe how fossils are used to interpret the history of life on Earth.
19. Explain the principles used to evaluate relative and absolute ages from the rock record and detail the ways in which one can correlate rock layers.
20. Learn about the rock and fossil record and how scientists determine the ages of different materials.

STANDARDS/BENCHMARKS:

Space Systems:

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.

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.

History of Earth

HS-ESS1-5 Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.

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.

HS-ESS2-1 Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

MS-ESS1-4 Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.

Earth's Systems

HS-ESS2-2 Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

HS-ESS2-3 Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.

HS-ESS2-4 Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.



HS-ESS2-5 Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. **

HS-ESS2-7 Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

Human Sustainability

HS-ESS3-1 Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

RESOURCES:

Fusion Earth Science book and online resources

One Stop Planner, Linked Lesson presentations, Extended Visual Labs

You Tube movies

E-games and links

Teacher's Extended Handouts

Lab Handouts

COURSE OUTLINE:

UNIT 2: SYSTEMS OF MATTER AND ENERGY.

Lesson 2: Minerals

Exploration 1: Introducing Minerals

Exploration 2: Properties of Minerals

Lesson 3: The Rock Cycle

Exploration 1: Rock and Rock Cycle



Exploration 2: Sedimentary Rock

Exploration 3: Igneous Rock

Exploration 4: Metamorphic Rock

UNIT 4: EARTH IN THE SOLAR SYSTEM

Lesson 1: Solar System Formation

Exploration 1: The Solar System

Exploration 2: Solar System Formation

Exploration 3: Evidence of the Earth's Early History

Lesson 2: Gravity and Orbits

Exploration 1: Planetary Movement

Exploration 2: Planetary Motion

Exploration 3: Gravity and Motion of Planets

Lesson 3: Earth and the Sun

Exploration 1: The Earth-Sun System

Exploration 2: Solar Energy in the Earth's System

Exploration 3: Earth- Sun System and Climate Change

UNIT 5: Space

Lesson 1: Observing Matter in Space (Reinforcement Sheet)

Exploration 1: Types of Observations

Exploration 2: The Doppler Effect

Exploration 3: Spectra

Exploration 4: Studying Objects

Lesson 2: Stars.

Exploration 1: Energy and the Sun

Exploration 2: Properties of Stars

Exploration 3: Star- Forming Regions

Exploration 4: Matter Transformations in Stars

Lesson 3: The Universe (Reinforcement Sheet)

Exploration 1: The Scale of the Universe

Exploration 2: Patterns in The Universe

Exploration 3: Mapping the Milky Way

Lesson 4: Evidence for the Big Bang

Exploration 1: What is the Big Bang Theory?

Exploration 2: Evidence of the Expanding Universe

Exploration 3: Evidence from the Early Universe

UNIT 6: Plate Tectonics

Lesson 1: Earth's Dynamic Interior (Refinement Sheet)

Exploration 1: Evidence of Structure and Composition



Exploration 2: Earth's Dynamic Interior

Lesson 2: Tectonic Plates

Exploration 1: Motion of the Earth's Surface

Exploration 2: Earth's Lithospheric Plaes

Lesson 3: Plate Interactions (Refinement Sheet)

Exploration 1: Divergent Boundaries

Exploration 2: Convergent Boundaries

Exploration 3: Transform Boundaries

Exploration 4: Causes of Plate Motion

Lesson 4: Natural Hazards (Reinforcement Sheet)

UNIT 7: EARTH'S CHANGING SURFACE

Lesson 1: Surface Processes.(Reinforcement Sheet)

Exploration 1: Agents of Change

Exploration 2: Weathering

Exploration 3: Transport of Material.

Exploration 4: Sediment and Soil

Lesson 2: Earth's Surface (Reinforcement Sheet)



UNIT 10: HISTORY OF EARTH

Lesson 1: The Rock and the Fossil Record

Exploration 1: Fossil Formation and Types of Fossils

Exploration 2: Evidence Provided by Fossils

Exploration 3: The Relative Ages of Rocks (Reinforcement Sheet)

Exploration 4: The Absolute Ages of Rock (Reinforcement Sheet)

Lesson 2: Geologic Time (Reinforcement Sheet)

GRADING:

1. Quizzes /tests are given every other week as assigned by school. **Our tests and assessments** consist of multiple-choice, short answer, direct application problems, critical thinking situations, refer to figures, texts, graphs and/or open response items. They are aligned with Michigan benchmarks. A student failing any of his quizzes would have to sit for a **support class and retest** to achieve his 60% which is our passing mark. **A progress report is sent to the parent eventually after sitting for the make up exam.** 40 % is given to students that do not have a medical excuse for missing such an assessment.

2.Skill Based Assignments are done in class where a student has his resources all opened in front of him to answer a set of questions under verbal, nonverbal, quantitative, and spatial domains.

3. Research Sessions are done where students can debate as groups and check the internet for resources and answers to support their ideas. This kind of assessment is under **Research /Project/ Lab Sessions /Journals**. They are evaluated to info, creativity, presentation, discussion and relation to the subject.

4.Daily assessments and drop quizzes take place to check the understanding of students.

5. Laboratory work is checked for research, completeness, accuracy, understanding the experiment, group and individual reports and attendance with the lab coats. Every semester has one term practical assessment.

7. Projects are integrated across and assigned for every term. They are evaluated to accuracy, creativity, info and relation to the subject.

Grade Distribution:

SCIENCE DEPARTMENT GRADE DISTRIBUTION	
HIGH SCHOOL	
End of semester assessment	30%
Quizzes	30%
Skill based Assessment	5%
Project	10%
Research/Journal	5%
Labs	10%
MAP	5%
Drop Quizzes	5%

Cross-Curricular Project(s):

- Once per semester across disciplines.