

High School Course Description for **Earth Science**

Course Title:	Earth Science/ SH Earth Sci.	Curricular Area:	Physical Science
Course Number:	SCI101/SCI102	Length:	One Year
Grade Level:	9-12	Prerequisites:	Algebra I or concurrent
Meets a UC a-g Requirement:		Meets NCAA Requirement:	
G- Elective			Yes - Science
Meets High School Graduation Requirement For:	Physical Science		

Course Description

This course covers the fundamental topics associated with the formation and changes in the earth's crust, meteorology, astronomy, paleontology, materials of the earth, earth cycles, history of the earth, and earth in space.

Alignment

This course is aligned to Earth Sciences California Content Standards for California public schools.

Instructional Materials

Required Textbook(s)

1. Earth Science California Ed., Prentice Hall 2007
ISBN 0-13-166-755-6

Supplemental Materials

1. Earth Science California Ed, Guided Reading & Study Workbook;
2. Earth Science California Ed Laboratory Manual;
GEODE CD-ROM
Student Express;

Suggested Video/DVDs//Films:

1. Discovery Channel
School Video Field Trips,
virtual Earth /Science Lab
2. Eyewitness Videos:
 - Volcano- 1996
 - Prehistoric Life-1996
 - Weather – 1996
 - Jungle – 1995
 - Rocks & Mineral –1996

3. Discovery Videos:

- Planet Storm (2003)
- Planet Earth (BBC) 2007
- The Blue Planet -2002
- 100 Greatest Discoveries (Bill Nye) Evolution /Earth Science 2005

Web Sites:

1. PHSchool.com
2. SciLinks.org/PD links

Exit Criteria

<u>Activities</u>	<u>Percentage</u>
Homework.....	20%
Classwork.....	20%
Tests	30%
Labs Activities Projects	15%
Final Examination.....	15% (8% Multiple Choice, 4% Written Essay, 3% Oral Presentation)
Total:	100%

Pacing Guide for Earth Science

First Quarter

Weeks: 1-3 Introduction to Earth Science

Unit 1, Chapter 1

- *Standard 1b-* Students know the evidence from Earth and moon rocks indicates that the solar system was formed from a nebular cloud of dust and gas approximately 4.6 billion years ago.
 - *Investigations 1f-* Distinguish between hypothesis and theory as scientific terms.
 - *Investigations 1g-* Recognize the usefulness and limitations of models and theories as scientific representations of reality.

Weeks: 4-7 Historical Geology

Unit 4, Chapters 12/13

- *Standard 1c-* Students know the evidence from geological studies of Earth and other planets suggest that the early Earth was very different from Earth today.
- *Standard 1f-* Students know the evidence for the dramatic effects that asteroid impacts have had in shaping the surface of planets and their moons and in mass extinctions of life on Earth.
- *Standard 6c-* Students know how Earth's climate has changed over time, corresponding to changes in Earth's geography, atmospheric composition, and other factors, such as solar radiation and plate movement.
- *Standard 8b-* Students know how the composition of Earth's atmosphere has evolved over geologic time and know the effect of outgassing, the variations of carbon dioxide concentration, and the origin of atmospheric oxygen.
 - *Investigations 1g-* Recognize the usefulness and limitations of models and theories as scientific representations of reality.
 - *Investigations 1i-* Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem).
 - *Investigations 1k-* Recognize the cumulative nature of scientific evidence.
 - *Investigations 1m-* Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.

Weeks 8-10 Matter, Minerals, and Properties of Minerals

Unit 1 Chapters 2-4 and Unit 4 Chapter 13a, sections 1&2

- *Standard 3c-* Students know how to explain the properties of rocks based on the physical and chemical conditions in which they formed, including plate tectonic processes.
- *Standard 4a-* Students know the relative amount of incoming solar energy compared with Earth's internal energy and the energy used by society.
- *Standard 4c –* Students know the different atmospheric gases that absorb the Earth's thermal radiation and the mechanism and significance of the greenhouse effect.
- *Standard 7a-* Students know the carbon cycle of photosynthesis and respiration and the nitrogen cycle.

Continued...

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Weeks 8-10 Matter, Minerals, and Properties of Minerals (continued)

Unit 1 Chapters 2-4 and Unit 4 Chapter 13a, sections 1&2

- *Standard 7b*- Students know the global carbon cycle: the different physical and chemical forms of carbon in the atmosphere, oceans, biomass, fossil fuels, and the movement of carbon among these reservoirs.
- *Standard 7c* - Students know the movement of matter among reservoirs is driven by Earth's internal and external sources of energy.
- *Standard 7d* - Students know the relative residence times and flow characteristics of carbon in and out of its different reservoirs.
- *Standard 8c*- Students know the location of the ozone layer in the upper atmosphere, its role in absorbing ultraviolet radiation, and the way in which this layer varies both naturally and in response to human activities.
- *Standard 9a* - Students know the resources of major economic importance in California and their relation to California's geology.
 - *Investigations 1d*- Formulate explanations by using logic and evidence.
 - *Investigations 1f*- Distinguish between hypothesis and theory as scientific terms.
 - *Investigations 1g*- Recognize the usefulness and limitations of models and theories as scientific representations of reality.
 - *Investigations 1k*- Recognize the cumulative nature of scientific evidence.
 - *Investigations 1l*- Analyze situations and solve problems that require combining and applying concepts from more than one area of science.

.....End of Quarter 1.....

Second Quarter

Weeks 11-12 Plate Tectonics

Unit 3 Chapter 9

- *Standard 3a*- Students know features of the ocean floor (magnetic patterns, age, and sea-floor topography) provide evidence of plate tectonics.
- *Standard 3b*- Students know the principal structures that form at the three different kinds of plate boundaries.
- *Standard 3d*- Students know why and how earthquakes occur and the scales used to measure their intensity and magnitude.
- *Standard 3f*- * Students know the explanation for the location and properties of volcanoes that are due to hot spots and the explanation for those that are due to subduction.
 - *Investigations 1i*- Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem).
 - *Investigations 1k*- Recognize the cumulative nature of scientific evidence.

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Weeks 13-14 Earthquakes and California Hazards

Unit 3, Chapter 8, Chapter 5.3 (Mass Movement/ CA Hazards), and Chapter 13a section 3

- *Standard 3d-* Students know why and how earthquakes occur and the scales used to measure their intensity and magnitude.
- *Standard 9b-* Students know the principal natural hazards in different California regions and the geologic basis of those hazards.
- *Standard 9d-** Students know how to analyze published geologic hazard maps of California and know how to use the map's information to identify evidence of geologic events of the past and predict geologic changes in the future.
 - *Investigations 1d-* Formulate explanations by using logic and evidence.
 - *Investigations 1m -* Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.

Weeks 15-16 Volcanoes

Unit 3, Chapter 10

- *Standard 3e-* Students know there are two kinds of volcanoes: one kind with violent eruptions producing steep slopes and the other kind with voluminous lava flows producing gentle slopes.
- *Standard 3f- ** Students know the explanation for the location and properties of volcanoes that are due to hot spots and the explanation for those that are due to subduction.
 - *Investigations 1d-* Formulate explanations by using logic and evidence.
 - *Investigations 1g-* Recognize the usefulness and limitations of models and theories as scientific representations of reality.

Week 17 Mountain Building

Unit 3, Chapter 11 (especially 11.1 Fault Types and 11.3 Plate Tectonics)

- *Standard 3b-* Students know the principal structures that form at the three different kinds of plate boundaries.
- *Standard 3c-* Students know how to explain the properties of rocks based on the physical and chemical conditions in which they formed, including plate tectonic processes.
- *Standard 9b-* Students know the principal natural hazards in different California regions and the geologic basis of those hazards.
 - *Investigations 1i -* Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem).

Week 18 Mountain Building

Unit 2, Chapter 5 and 6 Selections

5.2 Nitrogen Cycle/erosion, 6.1 Water Cycle, 6.3 Hot springs/geysers/caverns, and p.85 Carbon Cycle

- *Standard 7a-* Students know the carbon cycle of photosynthesis and respiration and the nitrogen cycle.
- *Standard 9b-* Students know the principal natural hazards in different California regions and the geologic basis of those hazards.

Continued...

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Week 18 Mountain Building (continued)

Unit 2, Chapter 5 and 6 Selections

5.2 Nitrogen Cycle/erosion, 6.1 Water Cycle, 6.3 Hot springs/geysers/caverns, and p.85 Carbon Cycle

- *Standard 9c-* Students know the importance of water to society, the origins of California’s fresh water, and the relationship between supply and need.
 - *Investigations 1b* - Identify and communicate sources of unavoidable experimental error.
 - *Investigations 1c* - Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.
 - *Investigations 1d* – Formulate explanations by using logic and evidence.
 - *Investigations 1m* - Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.

Week 19 Semester Exam

.....End of Quarter 2.....

Second Quarter

Weeks: 20-22 The Solar System

Unit 7 Chapters 22-23

- *Standard 1a-* Students know how the differences and similarities among the sun, the terrestrial planets, and the gas planets may have been established during the formation of the solar system.
- *Standard 1b* Students know the evidence from Earth and moon rocks indicates that the solar system was formed from a nebular cloud of dust and gas approximately 4.6 billion years ago.
- *Standard 1d-* Students know the evidence indicating that the planets are much closer to Earth than the stars are.
- *Standard 1f-* Students know the evidence for the dramatic effects that asteroid impacts have had in shaping the surface of planets and their moons and in mass extinctions of life on Earth.
- *Standard 4d-* * Students know the differing greenhouse conditions on Earth, Mars, and Venus; the origins of those conditions; and the climatic consequences of each.
 - *Investigations 1g* - Recognize the usefulness and limitations of models and theories as scientific representations of reality.
 - *Investigations 1i* - Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem).
 - *Investigations 1n* - Know that when an observation does not agree with an accepted scientific theory, the observation is sometimes mistaken or fraudulent (e.g., the Piltdown Man fossil or unidentified flying objects) and that the theory is sometimes wrong (e.g., the Ptolemaic model of the movement of the Sun, Moon, and planets).

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Weeks: 23-26 Stars and the Universe

Unit 7 Chapters 24-25

- *Standard 1d*- Students know the evidence indicating that the planets are much closer to Earth than the stars are.
- *Standard 1e* -Students know the Sun is a typical star and is powered by nuclear reactions, primarily the fusion of hydrogen to form helium.
- *Standard 1g* -* Students know the evidence for the existence of planets orbiting other stars.
- *Standard 2a*- Students know the solar system is located in an outer edge of the disc-shaped Milky Way galaxy, which spans 100,000 light years.
- *Standard 2b*- Students know galaxies are made of billions of stars and comprise most of the visible mass of the universe.
- *Standard 2c* Students know the evidence indicating that all elements with an atomic number greater than that of lithium have been formed by nuclear fusion in stars. -
- *Standard 2d*- Students know that stars differ in their life cycles and that visual, radio, and X-ray telescopes may be used to collect data that reveal those differences.
- *Standard 2e*- * Students know accelerators boost subatomic particles to energy levels that simulate conditions in the stars and in the early history of the universe before stars formed.
- *Standard 2f*- * Students know the evidence indicating that the color, brightness, and evolution of a star are determined by a balance between gravitational collapse and nuclear fusion.
- *Standard 2g*- * Students know how the red-shift from distant galaxies and the cosmic background radiation provide evidence for the "big bang" model that suggests that the universe has been expanding for 10 to 20 billion years.
 - *Investigations 1d* – Formulate explanations by using logic and evidence.
 - *Investigations 1i* - Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem).
 - *Investigations 1n* - Know that when an observation does not agree with an accepted scientific theory, the observation is sometimes mistaken or fraudulent (e.g., the Piltdown Man fossil or unidentified flying objects) and that the theory is sometimes wrong (e.g., the Ptolemaic model of the movement of the Sun, Moon, and planets).

Weeks: 27-28 Oceanography

Unit 5 Chapters 14, 15, 16 Selections

14.1- Sea floor mapping, 14.2- Review, 15.1- all, 15.2- all, 16.1- all

- *Standard 3a*- Students know features of the ocean floor (magnetic patterns, age, and sea-floor topography) provide evidence of plate tectonics.
- *Standard 5a*- Students know how differential heating of Earth results in circulation patterns in the atmosphere and oceans that globally distribute the heat.
- *Standard 5b*- Students know the relationship between the rotation of Earth and the circular motions of ocean currents and air in pressure centers.
- *Standard 5d*- Students know properties of ocean water, such as temperature and salinity, can be used to explain the layered structure of the oceans, the generation of horizontal and vertical ocean currents, and the geographic distribution of marine organisms.

.....End of Quarter 3.....

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Fourth Quarter

Weeks: 29-32 Atmosphere and Climate

Unit 6 Chapters 17, 21.1, 21.3

- *Standard 4b*-Students know the relative amount of incoming solar energy compared with Earth's internal energy and the energy used by society.
- *Standard 5a*- Students know how differential heating of Earth results in circulation patterns in the atmosphere and oceans that globally distribute the heat.
- *Standard 6a* -Students know weather (in the short run) and climate (in the long run) involve the transfer of energy into and out of the atmosphere.
- *Standard 6b* -Students know the effects on climate of latitude, elevation, topography, and proximity to large bodies of water and cold or warm ocean currents.
- *Standard 6c*- Students know how Earth's climate has changed over time, corresponding to changes in Earth's geography, atmospheric composition, and other factors, such as solar radiation and plate movement.
- *Standard 6d*- * Students know how computer models are used to predict the effects of the increase in greenhouse gases on climate for the planet as a whole and for specific regions.
- *Standard 8a*- Students know the thermal structure and chemical composition of the atmosphere.
- *Standard 8c*- Students know the location of the ozone layer in the upper atmosphere, its role in absorbing ultraviolet radiation, and the way in which this layer varies both naturally and in response to human activities.
 - *Investigations 1d* – Formulate explanations by using logic and evidence.
 - *Investigations 1g* –Recognize the usefulness and limitations of models and theories as scientific representations of reality.
 - *Investigations 1i* - Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem).
 - *Investigations 1m* - Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.

Weeks: 33-34

Review - Semester 1 Standards

STAR Testing Window

Weeks: 35-36 Water in the Atmosphere

Unit 6 Chapters 18.1-Air Pressure/Wind, 18.3- Cloud Types/Precipitation, 19 (all)

- *Standard 5a*- Students know how differential heating of Earth results in circulation patterns in the atmosphere and oceans that globally distribute the heat.
- *Standard 5b* -Students know weather (in the short run) and climate (in the long run) involve the transfer of energy into and out of the atmosphere.
- *Standard 5c*- Students know the origin and effects of temperature inversions.
- *Standard 5e*- Students know rain forests and deserts on Earth are distributed in bands at specific latitudes.

Continued...

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Weeks: 35-36 Water in the Atmosphere (continued)

Unit 6 Chapters 18.1, 18.3, 19

- *Standard 5f*- * Students know the interaction of wind patterns, ocean currents, and mountain ranges results in the global pattern of latitudinal bands of rain forests and deserts.
- *Standard 5g*- * Students know features of the ENSO (El Niño southern oscillation) cycle in terms of sea-surface and air temperature variations across the Pacific and some climatic results of this cycle.
- *Standard 6b* -Students know the effects on climate of latitude, elevation, topography, and proximity to large bodies of water and cold or warm ocean currents.
 - *Investigations 1d* – Formulate explanations by using logic and evidence.
 - *Investigations 1g* –Recognize the usefulness and limitations of models and theories as scientific representations of reality.

Week: 37 Weather Patterns and Severe Storms

Unit 6 Chapter 20 *

- *Standard 1d*- Students know the evidence indicating that the planets are much closer to Earth than the stars are.

Week: 38 Semester Exam

Instructional Guides for **Earth Science**

Key Assignments:

All CJUSD Earth Science courses will include all of the following key assignments:

- Semester 1 –
- 1) Rock Identification laboratory or project
 - 2) Half Life laboratory (Lab Investigations #12 p.89)
 - 3) Seismology Lab (Lab Investigations #8B)
or “Rockin’ and Rollin’ in the USA!” Earthquake Epicenter Lab
(attached)

- Semester 2
- 1) Astronomy Project- 3d model with oral presentation
or 3 pg min. research paper.

Instructor will provide a variety of sub-topics for students to choose from.

- 2) Modeling the Greenhouse Effect (Laboratory Investigations #21)
- 3) Ch. 17, Page 209 Investigation in Lab Manual

Learning Experiences and Instruction:

The course will utilize a variety of instructional strategies and delivery techniques including:

- Direct Instruction
- Laboratory Investigations
- Cornell Notes
- Small Group Investigations/ Discussions
- Guided Reading and Group Reading Comprehension Strategies
- Homework and assignment review and peer-checks