*Lecture Contact Hours: 48-54; Homework Hours: 96-108; Total Student Learning Hours: 144-162*

**CUYAMACA COLLEGE**
COURSE OUTLINE OF RECORD

## GEOLOGY 104 – EARTH SCIENCE

3 hours lecture, 3 units

**Catalog Description**
This physical science course studies the patterns and processes that define Earth's major physical systems, the basic energy and material flows by which these systems operate, and the comparative place of our planet within the larger solar system. Topics will be investigated at global, regional and local scales and will provide a general synthesis of the disciplines of astronomy, geology, physical geography, meteorology and oceanography. Environmental disturbance and climate change will be addressed within the context of the topics described above.

**Prerequisite**
None

**Course Content**
1) Introduction to physical science principles and system analysis
2) Introduction to the scientific method
3) Basic map reading and interpretation
4) Origin and age of the Universe; arrangement of stars into galaxies
5) Formation of the solar system and its major components (planets, moons, asteroids, comets); differences between Terrestrial and Jovian planets; age and life cycle of the Sun and Earth
6) Relative motions of the Sun, Moon, planets and stars; Earth motions, seasonal change, moon phases and eclipses
7) Use of latitude, longitude, time zones and the international date line
8) Heat and energy flows within and between Earth’s physical systems
9) Atmospheric and oceanic structure, composition and circulation
10) Elements, controls, and spatial patterns of weather, including atmospheric pressure and stability, temperature, wind, humidity, and adiabatic processes
11) Influence of continents and oceans on air masses, storms and jet stream dynamics
12) Seawater chemistry; heat and light in the ocean
13) Waves, tides and currents
14) Seismology and the Earth's interior
15) Formation of minerals and rocks and Bowen's Reaction Series
16) Rock type classification (igneous, sedimentary, metamorphic) and the rock cycle
17) Plate tectonics, earthquakes and volcanoes
18) Geologic time; relative and absolute dating techniques
19) Weathering, erosion and mass wasting
20) Fluvial, aeolian, and glacial processes and landforms
21) Mountain, desert and coastal environments
22) Environmental disturbance and climate change as relevant to topic discussions

**Course Objectives**
Students will be able to:
1) Utilize the principles of physical science to analyze Earth's major physical systems.
2) Outline and apply the scientific method to real world phenomena.
3) Analyze and interpret geospatial data on maps, tables and graphs.

4) Describe the origin and age of the Universe and explain the resulting formation of the solar system and its major components and controls.
5) Describe the relative motions of the Sun, Moon, planets and stars and explain the resulting physical phenomena of seasonal change, moon phases and eclipses.
6) Utilize latitude and longitude to calculate time, noon sun angles, and relative location on Earth.
7) Identify the elements, controls, and spatial patterns of the oceans and atmosphere in order to predict daily and seasonal changes in the weather.
8) Describe the influence of continents and oceans in determining air mass characteristics, storm genesis and decay, and jet stream dynamics.
9) Differentiate between weather related processes and resulting long-term climate patterns.
10) Analyze the elements of heat, light and seawater chemistry to explain the dynamic components of the world's oceans.
11) Describe the formation of waves, tides and currents and explain how these motions influence the exchange of heat and energy within and between the world's oceans and their effects on the atmosphere and continental margins.
12) Describe the Earth's internal structure and model the flow of heat and energy from the core to the surface.
13) Describe how minerals and rocks form, and classify rock and mineral types based on their physical properties.
14) Describe the elements, controls and spatial patterns of plate tectonics and explain the resulting seismic and volcanic processes and patterns seen at Earth's surface.
15) Analyze and interpret geologic and geomorphic phenomena within the context of geologic time.
16) Describe the role of weathering, erosion and mass wasting on superficial processes, and evaluate their relative influences in the development of Earth's major landforms.
17) Assess the role of landscape scale disturbance in the development and stability of Earth's environmental processes, and analyze the resulting influences on historical and modern climate change.

**Method of Evaluation**
A grading system will be established by the instructor and implemented uniformly. Grades will be based on demonstrated proficiency in subject matter determined by multiple measurements for evaluation, one of which must be essay exams, skills demonstration or, where appropriate, the symbol system.
1) Quizzes and exams that measure students' ability to recognize, explain and provide examples of the patterns, processes and relationships that contribute to and affect Earth's physical systems.
2) Spatial problem solving exercises in which students model real world applications of classroom and textbook materials (e.g., daily and seasonal earth-sun-moon relationships, ocean-atmosphere dynamics, geologic patterns and processes, etc.).
3) Earth science research project(s) in which students are required to analyze, interpret and draw conclusions from scientific sources.
4) Written student analysis based on historic and modern scientific evidence of the long-term effects of environmental disturbance and climate change on Earth's natural systems.

**Special Materials Required of Student**
None

**Minimum Instructional Facilities**
1) Smart classroom with writing board, overhead projector/screen
2) Wall maps illustrating global/regional scale spatial distributions of physical phenomena at Earth's surface (e.g., physiography, geology, climate, ocean basins, plate tectonics, etc.)
3) Physiographic globe(s)

**Method of Instruction**
1) Integrated classroom lecture, discussion and demonstration

2) Small and large group discussion
3) In-class activities and independent homework/ research projects
4) Field trips designed to link course materials to real world phenomena
5) Instructional slides, audio/video presentations
6) Auxiliary use of study groups, peer tutoring and/or instructional office hours

**Out-of-Class Assignments**
1) Reading assignments from text and/or other supplementary sources
2) Research for papers or writing assignments

**Texts and References**
1) Required (representative example): Lutgens, F.K. and E.J. Tarbuck. *Foundations of Earth Science*, 8th edition, 2017. ISBN-13: 978-0134184814, ISBN-10: 0134184815.
2) Supplemental: as assigned by instructor.

**Exit Skills**
Students having successfully completed this course exit with the following skills, competencies and/or knowledge:
1) Apply the scientific method to real world phenomena.
2) Analyze and interpret geospatial data on maps, tables and graphs.
3) Describe the origin and age of the universe and explain the resulting formation of the solar system and its major components and controls.
4) Describe the relative motions of the Sun, Moon, planets and stars and explain the resulting physical phenomena of seasonal change, moon phases and eclipses.
5) Utilize latitude and longitude to calculate time, noon sun angles, and relative location on Earth.
6) Describe how minerals and rocks form and classify rock and mineral types based on their physical properties.
7) Analyze and interpret geologic and geomorphic phenomena within the context of geologic time.
8) Identify the elements, controls and spatial patterns of the oceans and atmosphere in order to predict daily and seasonal changes in the weather.
9) Assess the role of landscape scale disturbance in the development and stability of Earth's environmental processes and analyze the resulting influences on historical and modern climate change.

**Student Learning Outcomes**
Upon successful completion of this course, students will be able to:
1) Apply the fundamental principles of geology to investigate how plate tectonics drives the rock cycle and how geologic phenomena shape the Earth's surface.
2) Utilize principles of geology, physics, and chemistry to explain the evolution of the Earth and interactions between the solid Earth, atmosphere, and oceans.
3) Apply the principles of Earth Science to understand the climate system and evaluate human influence on the Earth.