Mt. San Jacinto College
Integrated Course Outline of Record

Form B

Submitted by: Marlon Nance **Date:** 12/17/2019

Department	Subject	Course Number	Title
Geology	Geology GEOL	106	Earth Science

Units/Hours

Each lecture unit requires 1 hour per week of class time, and 2 hours per week of study outside of class.
Each laboratory unit requires 3 hours per week of class time.
Each activity unit requires 2 hours per week of class time and 1 hour per week of study outside of class.

Lecture Units	Lab Units	Total Units
3.00	1.00	4.00
Lecture Contact Hours	**Lab Contact Hours**	**Total Contact Hours**
48.00 - 54.00	48.00 - 54.00	96.00 - 108.00
Lecture Homework Hours	**Lab Homework Hours**	
96.00 - 108.00	0	

Stand Alone:

Program Applicable

AA/AS Degree General Ed Breadth Area(s):

A NATURAL AND PHYSICAL SCIENCES

General Education Justification:

Earth science covers aspects of physical sciences including geology, oceanography, meteorology, and astronomy. Students will understand Earth processes and be able to synthesize information and formulate information to reach valid conclusions (GELO1)(GELO3). In the lab portion, students will analyze lab exercises which require them to develop, evaluate, and describe solutions and hypotheses related to earth science (GELO 2). Students will also complete labs that utilize mathematical calculations such as stream discharge amounts (GELO 4).

Maximum Enrollment: 32

Maximum Enrollment Justification:

Justification:

Grading Method: Letter Grade or P/NP

TOP code: 1930.00

Can be Taken 1 **time(s) for credit** (max 4)

- ☐ - Visual or Performing Arts course that is required to meet major requirements for UC/CSU
- ☐ - Intercollegiate athletics course
- ☐ - Academic/vocational competition course

Catalog Description:

(Please do not refer to transferability or degree, certificate, or employment concentration applicability. Please only describe the course).
(**75 words** or less in gray box below).

This non-majors introductory course is a non-majors introductory course that reviews current topics in the fields of Astronomy, Geography, Meteorology, Geology, and Oceanography with an emphasis on the change in space and time for Earth as a system in a global environment. Topics include Earth's motions, the solar system, deep space, plate tectonics, minerals, rocks, earth's history, ocean, atmosphere, the water cycle, flooding, erosion, climate change, extinction, pollution, and human impact.

Schedule Description:

(Please do not refer to transferability or degree, certificate, or employment concentration applicability. Please only describe the course).
(**25 words** or less in gray box below).

This is an introductory course that reviews current topics in the fields of Astronomy, Geography, Meteorology, Geology, and Oceanography with an Environmental emphasis.

Need for the course:

This course is required for the Elementary Education ADT for elementary school teachers. It will also add another lab science for students.

Prerequisite(s):

Prerequisites go through a separate approval process. See Forms E1-E6 for details.
(For further clarification, contact the Prerequisite Subcommittee)

-none-

Corequisite(s):

Corequisites go through a separate approval process. See Forms E1-E6 for details.

-none-

Recommend Preparation:

Recommended Preparation goes through a separate approval process. See Forms E1-E6 for details.

-none-

Other Enrollment Criteria:

-none-

Learning Objectives:

(please number each objective and express in behavioral terms)
Upon the completion of the course the student will be able to do the following:

1. Categorize the composition, structure, and shape of the Earth, and inventory Earthâ€™s natural environments, the Earthâ€™s major systems, and the associated interactions.
2. Appraise the properties of materials in terms of arrangement and properties of the atoms that compose them.
3. Inventory and diagram the components of the solar system.
4. Analyze the theory of plate tectonics as it applies to earthquakes, volcanic activity, mountain belts, and the formation and movement of continents.
5. Classify the major rock and mineral groups and differentiate geomorphic processes and landforms.
6. Diagram the hydrologic cycle, illustrate the process of stream dynamics including erosion, deposition, and flooding, inventory and discuss effects on humans and the impact of humans on freshwater resources.
7. Assess the role of incoming solar radiation, ocean currents, and land masses in weather patterns and global climate of the past, present and future.
8. Analyze and debate the human impact on earthâ€™s systems and assess the associated environmental risks.
9. Use the scientific method of inquiry to evaluate Earthâ€™s processes and current environmental issues as they apply to earth science topics.
10. Inspect the interaction of the ocean with land at their interface in the coastal environment.
11. Examine aspects of the ocean including waves, tides, currents,and icebergs.
12. Investigate current theories about the origin and evolution of the universe and examine the place of the solar system in the universe.

Course Content:

(please number the outline of main topics and subtopics)

1. Introduction
    1. Why study the earth?
    2. Earth's natural environment
        1. oceans
        2. solid earth
        3. atmosphere
        4. biosphere
    3. Earth's four major systems
        1. plate tectonics
        2. core-mantle system
        3. physical climate system
        4. hydrologic cycle
    4. Interaction of the major Earth systems
        1. open Earth systems
            1. energy and mass transfer
        2. energy sources
            1. solar radiation
            2. internal heat and rotation of the earth
        3. closed Earth systems
            1. biogeochemical cycles
            2. ecosystems and life
            3. physical climate
    5. Methods of Scientific Inquiry
2. Astronomy
    1. Locating Objects in Space
        1. historical and modern methods
        2. the Hubble telescope
    2. Stars, Space and Galaxies
        1. life and death of stars
    3. Black Holes and Theory of Relativity
    4. The Solar System
        1. planets and their moons

5. Origin and Evolution of the Universe
6. Extraterrestrial Life

3. Earth's Materials and Time
    1. The Nature and States of Matter
        1. atoms, elements, compounds, and radioactivity
        2. changes of state
    2. Earth Materials
        1. soil
        2. rock
        3. minerals
    3. Basic Properties of Water
        1. temperature: freezing, evaporation and heat capacity
        2. pH
        3. salinity
        4. total dissolved solids and turbidity
        5. flow rate
        6. dissolution and hydration
    4. Gases in Earth's Environment
    5. Geologic Time
        1. relative time
        2. absolute time
        3. fossils: floral and faunal succession
        4. geologic time scale
            1. evolution
            2. mass extinction
    6. Geologic Resources
        1. minerals and rocks
        2. hydrocarbon resources
        3. resource conservation
4. Earth's Internal Structure and Processes
    1. Lithosphere, Mantle and Core
    2. Concepts of heat transfer, force, energy, gravity, and magnetism
    3. Plate Tectonics Theory
        1. Earthquakes and Volcanoes
        2. Geologic Structures and Mountain Building
        3. Movement and Building of Continents
5. Earth's Surface Processes and Environments
    1. Soil, Weathering, and Erosion
        1. mass wasting
        2. coastal erosion
    2. Hydrologic Cycle
        1. streams
        2. lakes
        3. ground water
        4. wetlands
        5. pollution
    3. Water Resources
        1. water pollution sources
        2. surface and ground water pollution
        3. case studies of water pollution and abetments
        4. water conservation
    4. Glaciers and Ice Ages
    5. Deserts and Winds
6. The Oceans

1. Ocean Basins
2. The Mid-Oceanic Ridge and Hydrothermal Vents
3. Seamounts, Islands, and Atolls
4. Marine Sediments and Minerals
5. Near Shore Waves and Tides
6. Long Shore and Rip Currents
7. Coastal Environments
8. Weathering and Erosion of Beaches
9. Human Interaction in the marine environment

7. The Atmosphere
    1. Evolution of the Atmosphere
    2. Atmospheric Layers, Composition, and Air Circulations
    3. Measurements of Air Flow, Moisture, Temperature, and Pressure
    4. Climate
        1. global winds and climate
        2. ocean and winds interaction
            1. El Nino
            2. La Nina tropical currents
    5. Climate Change
        1. carbon cycle and global warming
        2. sources of air pollution
            1. case studies of air pollution and abetments
        3. severe weather
        4. distribution and diversity of vegetation and animal populations

Lab Content:

(please number the outline of main topics and subtopics)

PART 1 GEOLOGY

1. The Study of Minerals
    1. Mineral groups
    2. Mineral properties
    3. Mineral identification
2. Rocks and the Rock Cycle
    1. Sedimentary rock properties, classification, and identification
    2. Igneous rock properties, classification, and identification
    3. Metamorphic rock properties, classification, and identification
3. Plate Tectonics
    1. Plate boundary types and associated tectonic activity
    2. Pangea and the history of plate movement
    3. Tectonic features of North America
4. Earthquakes and Earth’s Interior
    1. P and S waves
    2. Locating epicenter and focus
    3. Determining magnitude and intensity
5. Volcanism and Volcanic Hazards
    1. Types of volcanoes and eruptions
    2. Characteristics of lava flow, ash flows, and lahars
    3. Active volcanoes of North America
6. Geologic Maps, Block Diagrams, and Rock Structures
    1. Determining relative dating using geologic cross sections
    2. Using strike and dip to determine orientation of geologic structures
    3. Analysis of geologic maps
7. Aerial Photographs, Satellite Images, and Topographic Maps

1. Principles of reading topographic maps
2. Principles of air photographs
3. Using maps and air photos to analyze landforms and geologic structures

8. Shaping Earth's Surface: Running Water and Groundwater
    1. Stream systems, processes, and landforms
    2. Groundwater systems, processes, and landforms
    3. Exchanges between surface and groundwater systems
9. Shaping Earth's Surface: Arid and Glacial Landscapes
    1. Desert conditions and eolian processes, deposits, and landforms
    2. Processes, deposits, erosion, and glacial landforms of mountain glaciers
    3. Processes, deposits, erosion, and glacial landforms of continental glaciers
10. Geologic Time
    1. Using relative and absolute dating to understand Earth history
    2. Eons, Eras, Periods, and epochs in the geologic time scale
    3. Introduction to the fossil record as a way to understand Earth life history

PART 2 OCEANOGRAPHY

11. Introduction to Oceanography
    1. Aspects of study of the oceans; physical, chemical, geologic, biologic
    2. Equipment for gathering data and samples
    3. Temperature, salinity, and density layers of the ocean
12. Waves, Currents, and Tides
    1. Deep water and shallow water wave properties, coastal landforms
    2. Surface and thermohaline currents
    3. Causes of tides and tides in the coastal area

PART 3 METEOROLOGY

13. Earth-Sun Relationships
    1. Solar radiation and the electromagnetic spectrum
    2. Seasons and the tilt of the Earth
14. Heating the Atmosphere
    1. Temperature structure of the atmosphere
    2. Greenhouse effect and albedo
    3. The heat budget, isobars
15. Atmospheric Moisture, Pressure, and Wind
    1. The hydrologic cycle and phases of water
    2. Atmospheric pressure and global air circulation
    3. Local and prevailing winds, isobars
16. Air Masses, Mid-latitude Cyclones, and Weather Maps
    1. Air mass characteristics
    2. Cyclones; mid-latitude and tropical
    3. Weather maps and weather patterns
17. Global Climates
    1. Tropical and arid climates
    2. Mid-latitude climates
    3. Polar and highland climates

PART 4 ASTRONOMY

18. Astronomical Observations
    1. Light and telescopes
    2. The Sun
19. Patterns in the Solar System
    1. Terrestrial planet characteristics
    2. Gaseous planet characteristics
    3. Minor members of the Solar System

20. Locating the Planets
    1. Plane of the ecliptic
    2. Planet positions and distances
21. Examining the Terrestrial Planets
    1. Layered solid planets
    2. Atmospheres of the terrestrial planets
    3. Surface processes and features
22. Motions of the Earth-Moon System
    1. Moon phases
    2. Eclipses

PART 5 EARTH SCIENCE SKILLS

23. Location and Distance on Earth
24. The Metric System, Measurements, and Scientific Inquiry

Methods of Instruction:

Methods of instruction may include, but are not limited to the following:

- **Method:** Lecture
  Integration: Lecture complimented with audio-visual materials in the form of CD-ROM, videos, or PowerPoint presentations to include topics such as an explanation of the periodic table and a description of atoms, with demonstration and individual and/or group practice of diagramming atoms of the eight most abundant chemical elements in the Earthâ€™s crust.
- **Method:** Activity
  Integration: Large and small group cooperative learning activities that involve students in critical thinking and analytical discussions; for example, after students are assigned to read a journal article, the class may be divided into groups and asked to discuss the issues being addressed and evaluate the conclusions based on information learned in lecture and text reading
- **Method:** Lab Activities
  Integration: Hands-on lab activities that emphasize principles taught in lecture such as determining the relationships among velocity, slope, sediment size, channel shape, and volume of a stream; or determining the changing length of a shadow based on the motion of the Sun.
- **Method:** Observation and Demonstration
  Integration: Demonstration of geological phenomena, atmospheric measurements, or other physical processes to teach the principles of stream dynamics.

Methods of Evaluation:

A student's grade shall be determined by the instructor using multiple measures of performance related to the course objectives. Methods of evaluation may include but are not limited to the following:

- **Method:** Exams/Tests
  Integration: Examinations and quizzes requiring critical analysis and synthesis of information learned in lecture, from the textbook and reference material such as processes that contribute to certain formations of rocks.
- **Method:** Oral Presentation
  Integration: Oral presentations on current environmental issues that relate to course topics will be evaluated based on what understanding of the environmental issues and their relation to earth science
- **Method:** Class Performance
  Integration: Students will complete activities in lab; lab manuals will be evaluated for organization, completeness, and understanding.
- **Method:** Research Projects
  Integration: Research papers or posters that include a literature review, references, discussion and conclusion, and an abstract on topics such as stream erosion, carbon, nitrogen, and phosphorous cycles; alternative energy sources, historical global warming and sea level changes, marine environments and natural resources, tsunamis,

deforestation and soil erosion. Research projects will be evaluated based on subject appropriateness, focus, and organization.

Examples of Assignments:

Students will be expected to understand and critique college level texts or the equivalent. Reading and writing, as well as out of class assignments are required. These assignments may include but are not limited to the following:

Students are expected to understand and critique college level texts and research material and to demonstrate critical thinking in relationship to material presented in class and/or derived from out of class sources. Students are required to describe, compare and contrast, evaluate and synthesize major course topics in their own words and to formulate working definition of concepts and vocabulary introduced in the course. Demonstration of these skills may be assessed in a number of ways and various types of assignments may be given to evaluate the student's grasp of the material.

1. Small group activities, discussions, or presentations in class.
    1. "Use a flowchart to identify rocks and minerals" (objectives 1, 6).
    2. "Diagram atoms of the 4 most abundant elements in the Earth's crust" (objective 2).
    3. Develop solutions to assigned environmental problems (objectives 7, 9-11). For example "What can humans do to slow the rate of depletion of the ozone layer?"
    4. Read an assigned journal article on a current topic, discuss and evaluate the conclusions as a group, and summarize the evaluation orally to the class (3, 5, 7, 8-11). For example: "Read the March 2002 Discover article titled "'Can we find another Earth?' Be prepared to discuss the article with your group and present a summary to the class including your opinion of the author's conclusion."
2. Major projects that require several weeks of study and research.
    1. Write a research paper or compose and present a poster on a specific topic (objectives 3-11). For example: "Write an 8-10 page paper on 'The Process of Desertification and a Comparison of the Two American Deserts.' The paper must include a literature review, references, discussion and conclusion, and an abstract."
3. Writing assignments as weekly or bimonthly homework.
    1. Write a short essay on a given topic (objectives 1, 3-5, 7-11). For example, "after watching the NOVA video 'World in the Balance' write a one and a half to two page paper summarizing the affects of human activity on freshwater resources or air quality." (objective 7, 10, 11).

Textbooks:

- Tarbuck, E. J., Lutgens, F. K., Tasa, D. G. (2019). *Earth Science, 15th ed.* Pearson, Prentice Hall. ISBN: 9780134673943
- Reynolds, S., Johnson, J. (2019). *Exploring Earth Science, 2nd ed.* McGraw Hill. ISBN: 9781259638619
- Hendrix, M,Thompson, G. (2020). *Earth Science: An Introduction* Cengage. ISBN: 9780357116562

Other Resources:

- LaBlanc, Kelly. Earth Science Lab Manual. Kendall Hunt , 02-02-2016.
- Tarbuck, Edward J., Lutkins, Frederick K., Tasa, Dennis G.. Applications and Investigations in Earth Science, 9th. Pearson, Prentice Hall , 02-02-2019.
- Michael, Bradley D.. Investigations in Earth Science Lab Manual. Kendall Hunt , 02-02-2011.
- Mineral and rock collections for display
- Maps and models of the Earth and solar system
- Articles from journals: Science, Discover, American Scientist, Scientific American
- Videos on Earth Science and Environmental Topics

Minimum Qualification

- Earth Science (Masters Required)