Mt. San Jacinto College
Integrated Course Outline of Record

Form B

Submitted by: Patrick Smith **Date:** 10/08/2020

Department	Subject	Course Number	Title
Geology	Geology GEOL	105	Historical Geology

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:

This course examines complex issues such as plate tectonics in relationship to normal faulting and basement extension, and discovers the connections and correlations among ideas in Earth sciences (GELO1). It uses analysis to explain issues in quantitative terms using college-level mathematical concepts (equivalent to math 96) and methods including rates and motions on tectonic plates, fault rate calculations, and recurrence intervals (GELO4). Students are required to apply their theoretical knowledge and skills to real-world field geology exposures and situations (GELO5). Students will be exposed to the use of topographic and geologic maps and learn current geologic mapping techniques (GEL06).

Maximum Enrollment: 32

Maximum Enrollment Justification:

Course requires significant individualized instruction or assessment â€“ check all that apply:

*** Course relies on small group dynamics as a means of instruction or assessment.**

Course has safety or compliance factors which influence the enrollment cap â€“ check all that apply:

*** Course has safety or health reasons that the class should have a non-standard enrollment cap.**

Justification: This course includes a 3 hour per week lab class where students will break up into small lab groups to do their lab work and will need supervision by the instructor. In some labs some dangerous materials may be used (acid, etc.). In addition, small groups will be using delicate instruments and will need proper supervision during the labs.

Grading Method: Letter Grade or P/NP

TOP code: 1914.00

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 course examines the dramatic events of Earth's creation and development using Darwinian Theory and geologic time by venturing through the fossil record. Students explore Earth's unfolding saga starting from the Big Bang and following the violent tectonic relationships on the planet while investigating past life. Exciting topics include volcanoes, crystals, colliding continents, ancient oceans, radiometric dating, trilobites, dinosaurs, mass extinctions, mammals, the transition of reptiles to birds, and finally the evolution of Homo sapiens.

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 course explores the Big Bang, emerging life, dinosaurs, mass extinctions, Homo sapien beginnings, and geologic time with fossils and by venturing into Darwin's Evolution Theory.

Need for the course:

This course is a lower division requirement for students transferring into four year majors such as geology, geobiology, paleontology, seismology, and geophysics. This course will also provide an additional natural science course option for both the science and non-science student. It satisfies General Education Requirements for California State Universities and Colleges Transfer Plan Areas B1 and B3, IGETC Area 5, and MSJC AA/AS Area A. It can be used to satisfy requirements for the following awards IN BIOL, ENVS, and Liberal Arts: Math and Science.

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.

- College level reading skills and
- GEOL 100

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. Assess the Earth as a dynamic planet including the origin (Big Bang), composition, mountain-building, and evolution of the continents.
2. Explain the principles of the scientific method including the formulation of geological theories and complex course concepts effectively in writing and diagrams.
3. Identify hand samples of minerals and rocks (igneous, metamorphic, and sedimentary) by listing their physical properties.
4. Examine plate tectonics as a unifying theory including convergent, divergent and transform plate boundaries, and the processes of plate movement.
5. Assess the conceptual change of geologic time and the Earthâ€™s age throughout human history, and the strata-based formation of fossils, including fossil usefulness in differentiating geologic chronology.
6. Interpret geologic maps, cross-sections, and stratigraphic columns, in relationship to the principles of relative dating of geologic events.
7. Examine modern and past views of evolution and genetics, and the types of scientific evidence supporting evolutionary theory.
8. Investigate the Precambrian Earth including plate tectonics, atmospheric and hydrospheric evolution, and the emergence and early evolution of living organisms.
9. Assess Paleozoic Earth history with emphasis on continental architecture, paleogeography, orogenic events, and the role of microplates and terranes in the formation of Pangaea.
10. Examine Mesozoic Earth history with emphasis on the breakup of Pangaea, geologic activity in various North American regions, and the evolution of life.
11. Analyze Cenozoic Earth history, with a focus on plate tectonics and their influence on orogenic belts.
12. Illustrate primate and hominid evolution, and apply that to previously demonstrated areas of evolutionary theory.

Course Content:

(please number the outline of main topics and subtopics)

1. Dynamic and Evolving Earth
    1. planetary origin (Big Bang)
    2. Earth by composition and physical properties
    3. Uniformitarianism and scientific method
2. Plate Tectonics: A unifying Theory
    1. convergent, divergent, and transform plate boundaries
    2. plate movement, hotspots, and crustal evolution and deformation
    3. distribution of natural resources
3. Geologic Time: Concepts and Principles

1. concept of geologic time
2. relative time and dating
3. absolute time and dating

4. Earth Material: Rocks and Minerals
    1. minerals as building blocks
    2. igneous, metamorphic and sedimentary rock types
5. Rocks Fossils and Time - Making Sense of the Geologic Record
    1. stratigraphic relationships
    2. marine transgression, regressions
    3. fossil formation, placement in strata
6. Sedimentary Rocks – Archives of Earth History
    1. composition, texture
    2. depositional environments
    3. paleogeography
7. Evolution – Theory and Supporting Evidence
    1. past and modern views
    2. genetics
    3. supporting evidence
8. Preambrian Earth and Life History – Hadean and Archean
    1. continental foundations, plate tectonics
    2. atmosphere
    3. hydrosphere
    4. emergence of life
9. Precambrian Earth and Life History – Proterozoic Eon
    1. continents and supercontinents
    2. glaciers and glacial deposition
    3. atmosphere
    4. evolution of organisms
10. Early Paleozoic Earth History
    1. continental architecture
    2. paleogeography
    3. orogenic events
    4. evolution of North America
11. Late Paleozoic Earth History
    1. paleogeography
    2. evolution of North America
    3. Microplates and Terranes
12. Paleozoic Life History: Invertebrates
    1. Cambrian Explosion
    2. Shelly Fauna
    3. Marine Life
13. Paleozoic Life History: Vertebrates and Plants
    1. vertebrate evolution
    2. fish
    3. amphibians
    4. reptiles
    5. plants
14. Mesozoic Earth History
    1. breakup of Pangaea
    2. history of North America
    3. North American regions
15. Life of the Mesozoic Era
    1. marine invertebrates and phytoplankton
    2. aquatic and semiaquatic vertebrates

3. plants
4. diversification of reptiles
5. birds
6. mammals

16. Cenozoic Geologic History: Tertiary Period
    1. plate tectonics
    2. orogenic belts, events
17. Primate and Human Evolution
    1. definition of primates
    2. prosimians
    3. anthropoids
    4. hominins

Lab Content:

(please number the outline of main topics and subtopics)

1. Continental Drift and Plate Tectonics
    1. understanding plate movement
    2. divergent boundaries
    3. convergent boundaries
    4. transform boundaries
    5. speed and direction
    6. calculations and problems
2. Radiometric Dating
    1. principles
    2. parent/daughter isotopes
    3. alpha radiation
    4. beta radiation
    5. gamma radiation
    6. uses
    7. calculations and problems involving half-lives
3. Review of Earth Materials
    1. introduction of identification tools/equipment
    2. mineral composition
    3. mineral properties
    4. composition of rocks
    5. igneous rock types
    6. metamorphic rock types
    7. sedimentary rock types
    8. identification of hand specimens
4. Relative Dating - Sequences of Events
    1. sequences of events
    2. applying the principle of original horizontality
    3. applying the principle of superposition
    4. applying the principle of crosscutting relationships
    5. problem solving in stratigraphic relationships
    6. Interpret geologic maps
    7. Construct geologic cross-sections and stratigraphic columns
5. Principle of Uniformity
    1. definition
    2. as applied to ancient depositional environments
    3. as applied to modern depositional environments
    4. depositional environment identification and problem solving

6. Evidence of Evolution
    1. biological, physiological, and geological evidences of evolution
    2. vestigial structures
    3. ontogeny
    4. homologous structures
    5. floral and faunal evolution problems
7. Evolutionary Patterns
    1. interpreting patterns over time
    2. phylogenies
    3. comparative morphology
    4. isochronous and heterochronous convergence
    5. parallel evolution
    6. divergence
    7. phyletic gradualism and punctuated equilibrium
    8. Problem solving with evolution patterns
8. Fossils and Fossilization
    1. idefining fossils
    2. fossilization methods
        1. altered, unaltered, trace fossils, desiccation
        2. recrystalization, permineralization, replacement
        3. molds, casts, steinkerns
        4. carbonization
        5. coprolites, gastroliths
    3. what fossils can show about the past
    4. identification of hand specimens
9. Fossil Classification and Morphology (part 1)
    1. phylum
    2. isolating individual features
    3. protozoans
    4. porifera
    5. coelenterate
    6. bryozoa
    7. brachiopoda
    8. echinodermata
    9. identification of hand specimens
10. Fossil Classification and Morphology (part 2)
    1. mollusca
    2. annelida
    3. arthropoda
    4. hemichordate
    5. conodonta
    6. vertabrata
    7. identification of hand specimens
11. Biostratigraphic Correlation
    1. stratigraphic range
    2. visual correlation
    3. facies identification and correlation
    4. application of the principle of faunal succession
    5. biostratigraphic/lithostratigraphic problem solving
12. Dinosaurs
    1. identification of major genera
    2. construct and interpret cladograms
    3. identification of evolutionary adaptations
    4. relate adaptations with survival needs

5. relationship between feathers, dinosaurs, and birds

13. Hominin Fossils
    1. examine known hominin data
    2. progression from Adipithecus ramidus to Homo sapiens
    3. discuss physical features and time correlations
    4. problem solving in hominin evolution
14. Hominin Lab Report Presentations

Methods of Instruction:

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

- **Method:** Lecture
  Integration: Class lecture with PowerPoint and whiteboard illustrations on chapter-assigned topics. The whiteboard illustrations work well to show the structure of crystals, and the internal dynamics of the earth, as well as the various plate boundaries.
- **Method:** Outline Worksheet
  Integration: Distribution of outline worksheet for class lectures, to be filled in by the student during class discussion. The topics are listed on the worksheets helping the students to better correlate the lecture and textbook data. For example, plate tectonics terminology can be correlated with fossil distribution.
- **Method:** Study Guide
  Integration: Distribution of a study guide the week before each examination. The study guides are helpful in assessing critical lecture and textbook information.
- **Method:** Instructional-Guided Analysis
  Integration: Daily instructor-guided analysis and discussion of chapter and course content. During the lab, the instructor will visit with each student and assist them with personalized instruction. For example students will be assisted with assembling a map showing the ancient super continent Pangaea from the modern continents on the world map today.
- **Method:** Multimedia
  Integration: Videos, films, slides, charts, graphs, and maps presented in class as visual aids can be used to discuss fossil placement in relative and absolute timelines. Lab assignments will utilize many of these methods of instruction. For example, students will be given examples of evolutionary adaptations of the primary vertebrate and invertebrate marine animals and guided in the interpretation of evolutionary patterns seen in marine animals living in the ocean today.
- **Method:** Field Trips
  Integration: Field trips can be conducted to locations of geologic interest. For example, a field trip can include traveling to the Mojave National Preserve to quarry, classify, and assess trilobite fossils. Field trips will require preliminary research in scientific literature, and after-field trip papers which will focus students abilities to use critical thinking and the scientific method.

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: Written examinations in a mixed format that includes multiple-choice, true/false, fill in the blank, and short answer questions. Examination questions test both the studentsâ€™ knowledge of subjects dealing with historical geology and their ability to analyze and evaluate selected topics.
- **Method:** Papers
  Integration: Short answer papers written in a concise format addressing directed questions. The papers will express a synthesis of information obtained from lectures, the textbook, videos, graphs, etc. The papers can range form having students describe how changing geologic conditions affected the evolution of plants and vertebrates, to explaining the locations of various rock types and describing their mineral content.
- **Method:** Research Paper
  Integration: Multiple page research paper including abstract, literature review, discussion/conclusions, and

references in scientific citation style on pertinent topics such as analyzing the types of evidence supporting evolutionary theory or associating changes the atmosphere in correlation with plant evolution. Grade for paper will be on content, the proper use of standard academic English skills, and the proper use of scientific citation style.

- **Method:** Projects
  Integration: Projects, notebooks, and presentations as deemed appropriate by the instructor. For example, a presentation on the Evolution of Hominids would demonstrate a studentâ€™s understanding of the fossil record. Grade for projects, notebooks, and presentations will be based on content, proper use of standard academic English, and proper use of scientific citation style (citations only when applicable).

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:

Examples of assignments may include short answer papers written in a concise format and addressing specific questions as directed by the instructor, laboratory homework, research papers, etc.

- Short answer papers should express a synthesis of information obtained from lectures, textbook, videos, lab assignments, graphs, etc. The following are examples of short essay questions:
  - Discuss the division of primates into prosimian and anthropoid suborders.
  - What are the major distinguishing features between the seedless vascular plants and the gymnosperms, and why are these differences significant in terms of exploiting the terrestrial environment?
- Laboratory assignments should be completed primarily in the lab class and should consist of completing questions found in the lab book. The following are examples of short essay questions:
  - Reconstruct what you think to be the natural stratigraphic sequence of the fossil skulls in the supplied drawings, by arranging them based on their evolutionary development.
  - Determine and tabulate a sequence of events for the rock units in the map area. Subdivide the rocks in the illustration by identifying possible zones on the basis of fossil occurrence.

Textbooks:

- Reed Wicander and James S. Monroe (2016). *Historical Geology (or equivalent) 8th Edition* (4th ed/e). Thomson Brooks/Cole. ISBN: 1305119568
- Scott Ritter and Morris Peterson (2014). *Interpreting Earth History â€“ A Manual in Historical Geology 8th Edition* WCB/McGraw-Hill . ISBN: 9781478611455
- Oreskes, Naomi (2019). *Plate Tectonics An Insider's History Of The Modern Theory Of The Earth* CRC Press. ISBN: 0367317273

Other Resources:

Minimum Qualification

- Earth Science (Masters Required)