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	100	Physical 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 serves to fill Area "A" of the General Education Requirements. It 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). This course is needed to encourage an understanding of the relationship between the sciences of Geology (plate tectonics, earth materials, geo-operating systems, etc.) and human activities.

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 offers the student an understanding of planet Earth as an isolated, uniform, and dynamic system. Topics range from materials in the earth (crystals and rocks) to planet processes (explosive volcanoes; devastating landslides; and glistening glaciers) to an understanding of our planet's interior (destructive earthquakes and fiery cracks within deep sea floors). We live on a satellite isolated in space; our interactions with this dynamic, fragile system will determine our ultimate survival.

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 offers an understanding of planet Earth as an isolated, uniform, dynamic system that has explosive volcanoes, devastating landslides, and fiery cracks in the ocean floors.

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. This course include Active awards for Liberal Arts - Math/Science and ENVS ADT and AS, GEOL ADT, and BIOL ADT degrees. 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

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

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. Construct the zones of the Earth as a dynamic planet including the composition of the oceanic and continental crusts, the processes involved in mountain-building, deformation, and the evolution of the continents.
2. Discriminate earth materials and processes, and apply them using the scientific method to plate tectonics.
3. Organize the physical properties of minerals, igneous, metamorphic, and sedimentary rocks in relationship to the rock cycle.
4. Compare various modes of volcanism and the processes contributing to the creation of metamorphic rocks.
5. Compare and contrast the effects of mechanical and chemical weathering including the factors and processes involved in mass wasting.
6. Differentiate the effects of wind in desert environments and the problems associated with desertification through time.
7. Debate the effects of glacial environments and deposition, global environmental changes, and time frames using charts and diagrams.
8. Assemble coastal shoreline features and environments as well as fluvial and groundwater environments, by interpreting topographic and geologic maps.
9. Analyze the various methods of dating rocks including the relative and absolute dating methods using radiometric time and fossils.
10. Describe normal and reverse faults as well as left- and right-lateral faults, and their associated earthquake hazards and risks to humans.

Course Content:

(please number the outline of main topics and subtopics)

LECTURE

1. Introduction & Plate Tectonics
    1. Earth by materials
    2. Earth by physical properties
    3. convergent plate boundaries and subduction
    4. transform plate boundaries
    5. divergent plate boundaries
    6. plate tectonics and Earth's resource
2. Minerals
    1. atoms
    2. elements
    3. crystal structure

    4. mineral classification schemes
    5. mineral properties
3. Igneous Rocks/Processes
    1. intrusive rocks
    2. extrusive rocks
    3. crystal texture and mineral assemblage
    4. characteristics of volcano types
    5. mantle plumes
4. Sedimentary Rocks/Processes
    1. clastic, chemical and organic
    2. angularity
    3. sorting
    4. depositional systems
    5. lithification
    6. bedding and formations
    7. fossils
5. Metamorphic Rocks/Processes
    1. metamorphism
    2. metamorphic rock classifications
    3. foliation and mineral assemblage
    4. contact v. regional
    5. hydrothermal processes
6. Weathering
    1. mechanical weathering
    2. chemical weathering
    3. differential weathering
    4. transportation agents
    5. soils
7. Mass Wasting
    1. classifications
    2. controlling factors
    3. creep
    4. sediment flows
    5. slope failures
    6. falls
8. Streams and Floods
    1. alluvium
    2. floods
    3. drainage patterns
    4. stream erosion
    5. stream deposition
    6. transportation
9. Groundwater Hydrology
    1. porosity and permeability
    2. water table
    3. aquifers
    4. springs
    5. withdrawal and recharge
    6. karst topography
10. Deserts
    1. eolian process
    2. eolian landforms
    3. basin and range province
    4. basin and range features

5. desertification
11. Glaciation
    1. types of glaciers
    2. formation, growth and ablation
    3. movement
    4. glacial erosion
    5. glacial deposition
12. Marine Coastal Geology
    1. near shore circulation
    2. beaches
    3. longshore drift and sediment
    4. coastal features
    5. emergence v. submergence
    6. human impact
13. Geologic Time
    1. relative v. absolute time
    2. radiometric dating
    3. unconformities and correlations
    4. original horizontality
    5. lateral continuity
    6. cross-cutting relationships
    7. superposition
14. Seismology
    1. seismic wave types
    2. locating focus
    3. measuring size
    4. tsunamis
    5. liquefaction
    6. earthquakes at plate boundaries
    7. recurrence intervals

Lab Content:

(please number the outline of main topics and subtopics)

LAB

1. Plate Tectonics
    1. density, gravity, isostasy
    2. measuring rates of plate motion
    3. measuring alterations in plate direction
    4. predictions on future motion
    5. mid-ocean trenches
    6. mantle plumes
2. Minerals
    1. introduction to hand tools
    2. introduction to lab procedures
    3. mineral properties
    4. identification of hand samples
    5. Earth's resources
3. Igneous Rocks/Processes
    1. classifications
    2. composition
    3. texture and formation
    4. identification of hand samples
4. Sedimentary Rocks/Processes

1. classifications
2. composition
3. texture and angularity
4. identification of hand samples

5. Metamorphic Rocks/Processes
    1. classifications
    2. composition
    3. foliation and mineral assemblage
    4. identification of hand samples
6. Topographic Maps
    1. profiles and vertical exaggeration
    2. map symbols
    3. quadrangles, latitude, longitude
    4. analysis of mapped geologic features
7. Geologic Structures, Maps and Diagrams
    1. geologic units
    2. deformation
    3. outcrops
    4. strike and dip
    5. cross-sections
    6. analysis of geologic maps
8. Weathering, Streams and Mass Wastage
    1. stream topography
    2. stream erosion
    3. mass wastage
    4. flood hazard analysis
9. Groundwater Hydrology
    1. caves and karst topography
    2. movement rates of groundwater
    3. mapping the water table
    4. land subsidence
    5. groundwater contamination
10. Desert Deposits
    1. topography of desert features
    2. eolian processes
    3. desertification
    4. dune identification and classification
11. Glaciation
    1. glacial terrains and topography
    2. measuring glacial retreat
    3. glacial processes/resulting landforms
12. Coastal Processes
    1. coastal topography
    2. features of emergent coastline
    3. features of submergent coastline
    4. movement rate of barrier islands
    5. longshore current
    6. human impact
13. Geological Time/Dating
    1. relative time scale
    2. absolute time scale
    3. alpha, beta, gamma radiation
    4. parent/daughter isotopes
    5. dating calculations

14. Seismology
    1. P and S waves
    2. locating epicenter and focus
    3. recurrence intervals
    4. magnitude calculations
    5. earthquake prediction

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:** Activity
  Integration: Distribution of outline worksheet for each class lecture, 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 igneous rock 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. For example, mineral and rock assemblages can be correlated with geologic time.
- **Method:** Discussion
  Integration: Daily instructor-guided analysis and discussion of chapter and course content. During the lab, the instructor will visit with student groups and assist them with personalized instruction which will aid in course objectives. For example, mineral and rock identification, or distinguish between normal and reverse faulting.
- **Method:** Field Trips
  Integration: Field trips to museums, national and state parks, and other areas of geological interest to collect/analyze rocks samples or observe depositional systems.
- **Method:** Film/video Viewing and Discussion
  Integration: Videos, films, slides, charts, graphs, and maps presented in class as visual aids can be used to discuss stream patterns and mass wasting.
- **Method:** Lab Activities
  Integration: Lab assignments will utilize many of these same methods of instruction. For example, students will be given maps of glacial topography and guided in the interpretation of the effects of glaciers on the geologic landscape.

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:** Written examinations
  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 physical geology and their ability to analyze and evaluate selected topics.
- **Method:** Short answer 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 from having students describe how changing tectonic rates affected volcanic activity, to explaining the locations of various rock types and describing their mineral content. Evaluation will be accomplished with studentâ€™s adherence to standard scientific writing format, clarity, organization, grammar and spelling, etc. Evaluation will also include a demonstration of the studentsâ€™ knowledge of the topic and capacity to integrate multiple geologic concepts into the topic under discussion. In addition, an ability to display meaningful understanding of system dynamics will be taken into account.

- **Method:** Papers
  Integration: A research paper including abstract, literature review, discussion/conclusions, and references on pertinent topics such as contrasting eolian and glacial processes or associating the mineral composition of lava/magma with differing levels of volcanic eruption violence. Evaluation will be accomplished with studentâ€™s adherence to standard scientific writing format, clarity, organization, grammar and spelling, etc. Evaluation will also include a demonstration of the studentsâ€™ knowledge of the topic and capacity to integrate multiple geologic concepts into the topic under discussion. In addition, an ability to display meaningful understanding of system dynamics will be taken into account.
- **Method:** Projects
  Integration: Projects, notebooks, and presentations as deemed appropriate by the instructor. For example, a presentation on the frost wedging would demonstrate a studentâ€™s understanding of mechanical weathering. Evaluation will be accomplished with studentâ€™s adherence to standard scientific writing format, clarity, organization, grammar and spelling, etc. Evaluation will also include a demonstration of the studentsâ€™ knowledge of the topic and capacity to integrate multiple geologic concepts into the topic under discussion. In addition, an ability to display meaningful understanding of system dynamics will be taken into account.

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.

1. 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:
    1. Discuss the formation of igneous, metamorphic, and sedimentary rocks with respect to their textures and compositions (objective 3).
    2. What are the major distinguishing features between relative and absolute dating, and why are these differences significant in terms of understanding the age of the earth? (objective 9).
2. Laboratory assignments should be completed primarily in the lab class and should consist of completing questions found in the lab book. The example laboratory assignments below assess the student's ability to complete lab learning lab objectives.
    1. Demonstrate how you could find areas with a gradient of 20 m/km or greater on the topographic map supplied.
    2. Using the block diagrams supplied, complete the blank sides by drawing in the geologic units/contacts and faults. Then add strike-slip symbols where appropriate.

Textbooks:

- Richard Busch (2015). *Laboratory Manual in Physical Geology, 10th Edition* (8th Edition/e). Pearson Prentice Hall. ISBN: 0321944518
- Plummer, Carlson, McGeary (2019). *Physical Geology, 16th edition* (11th ed./e). McGraw Hill. ISBN: 1006528464

Other Resources:

Minimum Qualification

- Earth Science (Masters Required)