Mt. San Jacinto College
Integrated Course Outline of Record

Form B

Submitted by: Patrick Smith **Date:** 10/10/2019

Department	Subject	Course Number	Title
Geology	Geology GEOL	109	Geology of National Parks

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	Total Units
3.00	3.00

Lecture Contact Hours	Total Contact Hours
48.00 - 54.00	48.00 - 54.00

Lecture Homework Hours
96.00 - 108.00

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 for California State Universities. 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 changing climate (melting glaciers, ocean acidification in the Bahamas, etc.) and environmental hazards, and human activities.

Maximum Enrollment: 40

Maximum Enrollment

Justification: Justification:

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 reviews the landforms, rocks, and minerals that create the spectacular wonders of national parks throughout the United States. Emphasis is on materials (rocks, minerals); processes (weathering, erosion, mountain building); structure (folds, faults); stratigraphy (geological formations); and Earth's interior (plate tectonic processes). Upon completion students will be able to understand and described the geologic materials and environments of the United States national park system.

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 reviews the landforms, rocks, and minerals of spectacular national parks throughout the United States.

Need for the course:

This course is meant to provide a scientific understanding of the geological formations and features found in our national parks. It will complement other geologic courses and field trips which provide lecture, lab, and field experiences in national parks throughout western United States. The course will give the student a better understanding of the geological diversity exhibited in the natural world.

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. Document the Earth as a dynamic planet in relationship to geologic time and develop the Plate Tectonic Theory identifying the types of continental boundaries contributing to the National Park System.
2. Classify hand samples of minerals and identify them by their physical properties, and describe and identify various igneous, metamorphic, and sedimentary rocks found within various National Parks based on their texture and mineral composition.
3. Classify and categorize igneous rocks and intrusive igneous bodies found within various National Parks displaying volcanism.
4. Compare the effects of mechanical and chemical weathering as shown in the Grand Canyon and other National Parks, and classify the sediment, sedimentary rocks and sedimentary structures in National Parks throughout the western United States.
5. Arrange and associate metamorphic rocks processes to National Parks throughout the eastern United States.
6. Differentiate the processes involved in mountain-building and deformation as found in National Parks of the Sierra Nevadas, Rocky Mountains, and Appalachian Mountains
7. Predict the effects of glaciers and glaciation, as well as groundwater and running water found within Glacier National Park and Grand Teton National Park.
8. Derive the effects of wind and the desert environments in National Parks such as Death Valley, and those of the shoreline features in National Parks such as Acadia National Park, and be conversant concerning the processes creating them.
9. Calculate and analyze rates of motion and time intervals for plate tectonics, glacial advance and retreat, and weathering processes.

Course Content:

(please number the outline of main topics and subtopics)

1. Weathering and Erosion
    1. Learning how to classify rocks
    2. Understanding how a river system evolves.
    3. Introduction of geological structures.
    4. Examining sedimentary environments including the history of the Grand Canyon.
    5. Studying Zion, Bryce Canyon, Capitol Reef, Canyonlands ,Arches, Mesa Verde, Petrified Forest, Badlands, Theodore Roosevelt, and Kobuk Valley National Parks
        1. Exploring geologic history, settings and features of each park.
        2. Learning how mass wasting operates in arid regions.
        3. Gaining an understanding of how alcoves are formed.
        4. Discovering how wood turns to stone and how geodes are formed.
        5. Calculate radiometric time intervals for features within the parks.
2. Caves and Reefs
    1. A study of Mammoth Cave, Wind Cave, Carlsbad Caverns, Guadalupe Mountains, Virgin Islands, Everglades, Biscayne, and Dry Tortugos.
        1. Learning how caves are formed.
        2. Discovering the effect of tectonic activity in the Caribbean Region.
        3. Exploring the Wetland Environment including the ecosystems.
3. Continental or Alpine Glaciation
    1. A study of Voyageurs, Isle Royale, Acadia, Rocky Mountain, Waterton-Glacier International Peace, Cates of the Arctic, Yosemite, North Cascades, Olympic, Glacier Bay, Kenai Fjords and Denali National Parks
        1. Learning how Precambrian rocks are dated.
        2. Studying Metamorphic rocks
        3. Learning more about Igneous rocks.
        4. Exploring how glaciers increase the hazards of cascade volcanoes.

5. Gaining an understanding of how waves do geologic work.
6. Observing how plate tectonics and accreted terrance effect various geological formations.
7. Calculate rates of motion and analyze time intervals of glaciation.

4. Volcanic Features and Volcanic Activity.
    1. A study of Mount Rainier, Crater Lake, Lassen Volcanic, Katmai, Lake Clark, Hawaii Volcanoes, Haleakala, Yellowstone, and the National park of American Samoa.
        1. Gaining an understanding of what is meant by the “Fire Zone”
        2. Learning about the settings, features, history of each park
        3. Understanding how scientists are trying to forecast eruptions.
        4. Studying weathering and erosion, and its effects.
5. Structures in Areas of Complex Mountains
    1. A study of Grand Teton, Great Basin, Saguaro, Joshua Tree, Death Valley, Sequoia, Kings Canyon, Channel Islands, Redwood, Hot Springs, Big Bend, Shenandoah and Great Smoky Mountains National parks.
        1. Learning about the crustal extension
        2. Understanding the geographic setting and human history
        3. Gaining an understanding of the environment and various organisms
        4. Outlining the Appalachian evolution.

Methods of Instruction:

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

- **Method:** Lecture
  Integration: Class lecture with whiteboard illustrations on chapter-assigned topics. The whiteboard illustrations work well to show the internal dynamics of the earth as well as the various plate boundaries found in various National Parks (objective 1).
- **Method:** outline worksheet
  Integration: Distribution of outline worksheet for each class lecture, to be filed 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 found in the objectives. For example, orogenies of the Sierra Nevadas, Rocky Mountains, and Appalachian Mountains (objective 5) can be correlated with various igneous, metamorphic, and sedimentary rocks found within various National Parks (objective 2). Worksheets may also include rate and time problems for the students to calculate and analyze.
- **Method:** study guide
  Integration: Distribution of a study guide the week before each examination. The study guides are helpful in assessing and integrating critical lecture and textbook information found in the objectives.
- **Method:** Discussion
  Integration: Daily instructor-guided analysis and discussion of chapter and course content to help students assess and discriminate daily discussion.
- **Method:** multi-media
  Integration: Videos, films, slides, charts, graphs, and maps presented in class as visual aids can be used to discuss the Earth as a dynamic planet. In this way students can see summarize geologic features found within National Parks.
- **Method:** Field Trips
  Integration: Field trips at the instructors discretion
- **Method:** Observation and Demonstration
  Integration: Use of power point during lecture will help students classify the sediment, sedimentary rocks and sedimentary structures in National Parks throughout the western United States.(objective 3). Use of said media will also demonstrate how to associate metamorphic rocks' processes to National Parks throughout the eastern United States (objective 4).

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, short answer questions, and story problems calculations. Examination questions test both the studentsâ€™ knowledge of subjects dealing with Physical Geology and their ability to analyze and evaluate selected topics. The intent of these tests is to evaluate the students analytical and categorizing ability.
- **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 rang form having students describe the effects of glaciers in Glacier National Park (objective 6), to describing the desert systems in Death Valley (objective 8). These papers will be evaluated with respect to content most significantly.
- **Method:** research paper
  Integration: Ten page research paper including abstract, literature review, discussion/conclusions, and references on pertinent topics such as An Overview of Vulcanism in Western National Parks (objective 3) or Metamorphic processes in National Parks of the Eastern United States (objective 4). For these papers, both content and form will be evaluated.
- **Method:** Projects
  Integration: Projects, notebooks, and presentations as deemed appropriate by the instructor. For example, a presentation on The Sierra Nevada Orogeny would indicate a students understanding of plate tectonics within Yosemite National Park (objective 1). For these projects evaluation will focus primarily on content.

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:

Example Assignments

1. On one page, summarize the geologic history of Death Valley beginning with the basement complex rocks and ending with the deposition of Furnace Creek Basin sediments. (Hint: pay close attention to the time charts on page xiii and 48 of Geology of Death Valley National Park by Miller and Wright.)
2. State the formation name, prevailing rock type, age in absolute time, and describe the environment of deposition for each of the formations (bottom to top; oldest two youngest) of the Paleozoic to Cenozoic rocks in the Grand Canyon.
3. What is meant by the term "slope former" and "cliff former"? Name the slope forming formation of the Paleozoic Tonto Group, and described why it is a "slope former" in relation to the rocks above and below it. (Hint: named the formations and rock types above and below it, and described the slope forming characteristics of each.)
4. Briefly describe the Cenozoic history of the Grand Canyon including uplift, major faulting, and erosion of the canyon. Include absolute timing, and a calculation (with explanation) of the average erosion rate of the canyon in inches/year and mm/year. (Note: 1 inch = 2.54 cm, 1 m = 3.28 feet, 1 cm = 10 mm, 100 cm = 1 m, 1000 m = 1 kilometer)

Textbooks:

- Ann G. Harris, Esther Tuttle, and Sherwood D. Tuttle (2003). *Geology of National Parks (or equivalent)* (6th Edition/e). Kendall/Hall Publishing Company . ISBN: 0-7872-9970-7
- Ellwood Brooks (2018). *Physical Geology with Emphasis on America's National Park Areas* Kendall Hunt Publishing. ISBN: 1524971472

Other Resources:

Minimum Qualification

- Earth Science (Masters Required)