GEOLOGY

BACHELOR OF ARTS
BACHELOR OF SCIENCE
SUBJECT MATTER PROGRAM
MINOR

PROGRAM DESCRIPTION

Geology is the study of the earth, its environments, and its past inhabitants. It is an interdisciplinary science that combines geological observations and concepts with those of biology, chemistry, physics and mathematics. Its goals are to study rocks, minerals, and fossils, and to understand geologic principles and the processes that shape the earth and its environments.

The CSUS Geology program has three objectives: 1) to encourage students to think scientifically, 2) to provide students with the knowledge base to make progress in Geology after leaving CSUS, and 3) to teach students basic skills such as how to use a petrographic microscope, how to construct a geologic map, and how to write a technical geologic report.

The BA degree program is designed as a shorter, less rigorous preparation for some geology jobs, earth science teaching in high school (see Teaching Credential), and jobs such as park naturalist, environmentalist, geologic planning specialist, or in geology-related businesses. The BA degree can be used in dual-track majors combining geology with biological sciences, chemistry, physics, or engineering.

The BS degree program is designed to be the best possible preparation for advanced work in geology in graduate school or for professional employment as a geologist. The Geology program offers a strong background in the major areas of geology including: mineralogy, petrology, paleontology, stratigraphy, structural geology, field mapping, and report writing.

FEATURES

Among the greatest attractions for studying geology at CSUS is the university’s location in a dynamic geologic environment. Just 70 miles to the west is the San Francisco Bay area and the San Andreas fault. About equidistant to the east is the magnificent Sierra Nevada mountain range. The active geology faculty conducts field trips in almost every course in the Geology major, providing excellent opportunities for students to learn field skills and to apply classroom knowledge to field situations.

A small student/teacher ratio, plus a rigorous course of study, contribute to the excellent reputation of the CSUS Geology Department with employers and graduate schools. Contact the Department office for assistance in obtaining a faculty advisor.

In Spring of 1997 the Department will be located in a 60,000 square foot building with the United States Geological Survey.

Marine Geology

Students interested in marine geology may take courses at Moss Landing Marine Laboratories at Moss Landing, CA, 180 miles from the CSUS campus. The labs and available courses are described under the Marine Sciences section of this catalog. A program including Moss Landing courses may be formulated with a Geology advisor. Such a program usually requires living in or near Moss Landing for one or more semesters.

CAREER POSSIBILITIES

Geologist • Geophysicist • Groundwater Geologist • Oil and Gas Geologist • Mineralogist • Paleontologist • Photogeologist • Seismologist • Consulting Geologist • Soils Engineer • Land Use Planner • Volcanologist • Astrogeologist • Geochemist • Marine Geologist • Environmental Geologist • Economic Geologist • Mining Geologist • Hydrologist • Government Geologist • Coal Geologist • Glacial Geologist • Vertebrate Paleontologist • Geology Professor • Earth Science Teacher

FACULTY

Diane Carlson, Department Chair
Diane Carlson; Brian Hausback; Tim Horner; Judi Kusnick; Paula Noble; Charles Plummer; Susan Slaymaker; Gregory Wheeler
Rosemary Burnham Shinault, Department Secretary
Department Office, SCI-226, 278-6337
## MAJOR REQUIREMENTS • BA

<table>
<thead>
<tr>
<th>Total units required for BA: 124</th>
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<tbody>
<tr>
<td>Total units required for Major: 56 - 59</td>
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</tbody>
</table>

Courses in parentheses are prerequisites.

### A. Required Lower Division Courses (20-23 units)

1. **GEOL 10** Physical Geology
2. **GEOL 10L** Physical Geology Lab
3. **GEOL 10** Historical Geology (GEOL 1, 1L; or GEOL 10)
4. **CHEM 1A** General Chemistry
5. **MATH 30** Calculus I OR MATH 29 Precalculus Mathematics AND MATH 26A Calculus I for the Social and Life Sciences
6. **PHYS 5A** General Physics: Mechanics, Heat, Sound OR **PHYS 11A** General Physics: Mechanics

### B. Required Upper Division Courses (36 units)

1. **GEOL 100** Mineralogy (GEOL 10; high school or college algebra; CHEM 1A)
2. **GEOL 101** Techniques of Field Geology (GEOL 10; 10L or 11; 12; MATH 29 or high school trigonometry. GEOL 12 may be taken concurrently, GEOL 120 should be taken concurrently)
3. **GEOL 102** Igneous Petrology (GEOL 100)
4. **GEOL 103** Sedimentary Petrology (GEOL 10, 10L, 12, 100, ENG 1A)
5. **GEOL 104** Metamorphic Petrology (GEOL 102)
6. **GEOL 105** Paleontology (GEOL 10, 12)
7. **GEOL 107** Applied Geology (GEOL 10, 10L, CHEM 1A)
8. **GEOL 110** Structural Geology (GEOL 10, 10L, 12, 100, 101, 103, 111; PHYS 5A or 11A; MATH 29 or high school trigonometry; proficiency using a personal computer)
9. **GEOL 111** Field Methods (GEOL 10, 12, 101, 103, 120, all with grade “C-” or better. GEOL 103 may be taken concurrently.)
10. **GEOL 112** The Physics and Chemistry of the Earth (GEOL 10)
11. **GEOL 115** Stratigraphy (GEOL 101, 103, 110, 112, GEOL 110 may be taken concurrently.)
12. **GEOL 119** Field Mapping (GEOL 102, 110, 111, 115, 120)
13. **GEOL 120** Applied Geomorphology (GEOL 101 concurrent enrollment is recommended.)
14. Electives Consult Geology advisor for list of approved electives

**Note:** Attendance at 16 colloquia, verified by faculty signature, is required.

The following sequence is recommended:

1. **Freshman Year**
   - **Fall semester**
     - GEOL 10
     - MATH 30
   - **Spring semester**
     - GEOL 10L
     - PHYS 5A

2. **Sophomore Year**
   - **Fall semester**
     - GEOL 12
   - **Spring semester**
     - CHEM 1A

### 3. Junior Year

<table>
<thead>
<tr>
<th>Fall semester</th>
<th>Spring semester</th>
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<tr>
<td>GEOL 100</td>
<td>GEOL 103</td>
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<td>GEOL 101</td>
<td>GEOL 111</td>
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<td>GEOL 107</td>
<td>GEOL 112</td>
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<td>GEOL 120</td>
<td>GEOL 120</td>
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### 4. Senior Year

<table>
<thead>
<tr>
<th>Fall semester</th>
<th>Spring semester</th>
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<tbody>
<tr>
<td>GEOL 102</td>
<td>GEOL 104</td>
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<tr>
<td>GEOL 110</td>
<td>GEOL 105</td>
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<tr>
<td>GEOL 115</td>
<td>GEOL 119</td>
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The BS requires additional lower division courses; GEOL 106 in Spring semester and a summer field camp.

## MAJOR REQUIREMENTS • BS

<table>
<thead>
<tr>
<th>Total units required for BS: 124</th>
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<tr>
<td>Total units required for Major: 79</td>
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</table>

Courses in parentheses are prerequisites.

### A. Required Lower Division Courses (35 units)

1. **GEOL 10** Physical Geology
2. **GEOL 10L** Physical Geology Lab
3. **GEOL 12** Historical Geology (GEOL 1, 1L; or GEOL 10)
4. **CHEM 1A** General Chemistry
5. **MATH 30** Calculus I OR **MATH 29** Precalculus Mathematics AND **MATH 26A** Calculus I for the Social and Life Sciences
6. **PHYS 5A** General Physics: Mechanics, Heat, Sound OR **PHYS 11A** General Physics: Mechanics

### B. Required Upper Division Courses (44 units)

1. **GEOL 100** Mineralogy (GEOL 10; high school or college algebra; CHEM 1A)
2. **GEOL 101** Techniques of Field Geology (GEOL 10; 10L or 11; 12; MATH 29 or high school trigonometry. GEOL 12 may be taken concurrently, GEOL 120 should be taken concurrently)
3. **GEOL 102** Igneous Petrology (GEOL 100)
4. **GEOL 103** Sedimentary Petrology (GEOL 10, 10L, 12, 100, ENGL 1A)
5. **GEOL 104** Metamorphic Petrology (GEOL 102)
6. **GEOL 105** Paleontology (GEOL 10, 12)
7. **GEOL 107** Applied Geology (GEOL 10, 10L, CHEM 1A)
8. **GEOL 110** Structural Geology (GEOL 10, 10L, 12, 100, 101, 103, 111; PHYS 5A or 11A; MATH 29 or high school trigonometry; proficiency using a personal computer)
9. **GEOL 111** Field Methods (GEOL 10, 12, 101, 103, 120, all with grade “C-” or better. GEOL 103 may be taken concurrently.)
10. **GEOL 112** The Physics and Chemistry of the Earth (GEOL 10)
11. **GEOL 115** Stratigraphy (GEOL 101, 103, 110, 112, GEOL 110 may be taken concurrently.)
12. **GEOL 119** Field Mapping (GEOL 102, 110, 111, 115, 120)
13. **GEOL 120** Applied Geomorphology (GEOL 101 concurrent enrollment is recommended.)
14. Electives Consult Geology advisor for list of approved electives

**Note:** Attendance at 16 colloquia, verified by faculty signature, is required.

The following sequence is recommended:

1. **Freshman Year**
   - **Fall semester**
     - GEOL 10
     - MATH 30
   - **Spring semester**
     - GEOL 10L
     - PHYS 5A

2. **Sophomore Year**
   - **Fall semester**
     - GEOL 12
   - **Spring semester**
     - CHEM 1A

3. **Junior Year**
   - **Fall semester**
     - GEOL 100
     - GEOL 101
     - GEOL 107
     - GEOL 120
   - **Spring semester**
     - GEOL 103
     - GEOL 111
     - GEOL 112

4. **Senior Year**
   - **Fall semester**
     - GEOL 102
     - GEOL 110
     - GEOL 115
     - GEOL 119

The BS requires additional lower division courses; GEOL 106 in Spring semester and a summer field camp.
Completion of the degree requires attendance at 16 colloquia to be verified by faculty signature. A geology summer field camp is also mandated (in senior year). This is usually a four to six week commitment.

**SUBJECT MATTER PROGRAM (Pre-Credential Preparation)**

Geology majors who intend to pursue a teaching credential must complete the science subject matter program which is described in this catalog. Successful competition of this program fulfills the subject matter competence requirement and qualifies students to enter the teaching credential program in the School of Education. The Science Teaching Credential allows graduates to teach all four of the sciences (Geoscience, Biology, Chemistry and Physics) at the General Science level in 7-12 grades, and Geoscience at an advanced level in high school.

Currently there is a great need for K-12 teachers educated in science. Changes in State Board of Education Standards and increasing interest in earth and space sciences has created significant demand for students with this credential. Geology majors who have an interest in teaching should contact the credential advisors in the Geology Department (Greg Wheeler or Judi Kusnick).

**MINOR REQUIREMENTS**

Total units required for Minor: 18

Specific course requirements are:

<table>
<thead>
<tr>
<th>(3)</th>
<th>GEOL 10</th>
<th>Physical Geology</th>
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<tbody>
<tr>
<td>(1)</td>
<td>GEOL 10L</td>
<td>Physical Geology Lab (GEOL 10; may be taken concurrently) OR</td>
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<tr>
<td>GEOL 11</td>
<td>Field Laboratory for Physical Geology (GEOL 10; may be taken concurrently)</td>
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<tr>
<td>(3)</td>
<td>GEOL 12</td>
<td>Historical Geology (GEOL 10)</td>
</tr>
<tr>
<td>(1)</td>
<td>GEOL 13</td>
<td>Historical Geology Lab (GEOL 12; may be taken concurrently)</td>
</tr>
<tr>
<td>(10)</td>
<td>Electives</td>
<td>Select 10 units of upper division courses in Geology</td>
</tr>
</tbody>
</table>

Students wishing a geology minor must contact a Geology advisor before beginning upper division work in Geology.

**LOWER DIVISION COURSES**

1. **General Geology.** General Geology is a combination of physical geology (i.e., volcanoes, landscapes, earthquakes, rocks and minerals) and historical geology (i.e., geologic time, fossils, evolution). Highlights of each are covered in a broadly based course specifically for the individual who is unlikely to take more than one geology course while in college. **Note:** students contemplating a geology major or minor or any further courses in geology should enroll in GEOL 10, not GEOL 1. No credit for those who have taken GEOL 10 or equivalent. Lecture. Students may take GEOL 1L for laboratory credit. 3 units.

1L. **General Geology Lab.** Laboratory supplement to GEOL 1. Emphasizes scientific method and systematic laboratory procedures. Includes identification of common rocks, minerals and fossils, topographic and geologic map interpretation, earthquake record analysis, correlating fossils and geologic time. Laboratory 3 hours. **Prerequisite:** GEOL 1; may be taken concurrently. 1 unit.

8. **Earth Science.** The earth and its neighbors in space. Scientific method and discovery in the study of stars, planets, weather, rivers, glaciers, oceans, rocks, volcanoes, earthquakes, landslides, mountains, drifting continents, the earth in time. **Note:** students contemplating a geology major or minor or any further courses in geology should enroll in GEOL 10, not in GEOL 8. No credit for those who have taken GEOL 10 or equivalent. 3 units.

8L. **Earth Science Lab.** Emphasizes scientific methods and systematic laboratory procedures. Includes weather analysis, rock and mineral identification, study of geologic concepts by means of topographic maps, and exercises in astronomy and oceanography. Laboratory three hours. **Prerequisite:** GEOL 8; may be taken concurrently. 1 unit.

10. **Physical Geology.** Rocks and their mineral constituents, geological processes such as weathering, erosion, glaciation, mountain building, etc., volcanoes, earthquakes, folds, faults, the earth’s interior, plate tectonics and earth resources. Field trip. Fee course. 3 units. (GEOL 10 and 10L=CAN GEOL 2)

10L. **Physical Geology Lab.** Laboratory supplement to GEOL 10. Emphasizes scientific method and systematic laboratory procedures. Identification of common minerals and rocks. Introduction to and analysis of topographic and geologic maps. Field trip. Laboratory three hours. Fee course. **Prerequisite:** GEOL 10; may be taken concurrently. 1 unit. (GEOL 10 and 10L=CAN GEOL 2)

11. **Field Laboratory for Physical Geology.** Laboratory supplement for GEOL 10 involving geological field studies. Fieldwork will be carried out during one or more weekends. The remainder of the course will be in the laboratory. Students will be expected to apply scientific techniques to identify rocks and minerals, determine geologic structures and processes of landform change. For the Spring semester, GEOL 10 may be taken concurrently; for the Fall semester, permission of instructor is required to take it concurrently. Fee course. **Prerequisite:** GEOL 10. 1 unit.

12. **Historical Geology.** Origin and geological history of the earth and the evolution of its animal and plant inhabitants. Fee course. **Prerequisites:** GEOL 1, 1L; or GEOL 10. 3 units.
12L. Historical Geology Lab. Supplements GEOL 12. Use of sedimentary rocks, fossils, geologic maps, and structural sections in interpreting ancient environments, tectonic settings, and geologic history. Age relations and correlation of rock and time-rock units. Introduction to fossil identification and biostratigraphy. Laboratory three hours. Prerequisite: GEOL 12; may be taken concurrently or GEOL 1L or 10L. 1 unit.

50. Rocks, Minerals, and Fossils. Rocks, minerals and fossils are studied in the context of their geologic setting. Topics in the course include: reasons why some minerals are valued; the relationships of rocks and minerals to various cultures; internal and external properties of minerals, the origin and characteristics of the principal rock types; how fossils form; and major fossil groups. Lecture one hour, laboratory three hours. 2 units.

**UPPER DIVISION COURSES**

100. Mineralogy. Determinative mineralogy. Introduction to crystal structure and determination of minerals by crystal form, hardness, cleavage, other physical tests, and genetic association. Lecture two hours, laboratory six hours. Prerequisites: GEOL 10; CHEM 1A; high school or college algebra. 4 units.

101. Techniques of Field Geology. Drafting materials and techniques. Construction and interpretation of topographic maps, geologic maps, facies maps, topographic profiles, geologic cross-sections, and stratigraphic columns. Correlation of rock and time-rock units. Use of the Brunton compass. Field trip. Laboratory three hours. Fee course. Prerequisites: GEOL 10; 10L or 11; 12; (GEOL 12 may be taken concurrently); GEOL 120 should be taken concurrently; MATH 29 or high school trigonometry. 1 unit.

102. Igneous Petrology. A study of the origin, evolution, occurrence, geochemistry, dynamics and physical characteristics of volcanic and plutonic rocks. The laboratory will focus on hand specimen examination as well as petrographic microscope studies. Fee course. Field trip. Lecture one hour, laboratory six hours. Prerequisite: GEOL 100. Fall only. 3 units.

103. Sedimentary Petrology. Compositions, textures, classifications, origins and structures of sediments and sedimentary rocks. Hand specimen observation and interpretation. Field trip. Fee course. Lecture two hours; laboratory three hours. Fee course. Prerequisites: GEOL 10, 10L, 12, 100; ENGL 1A or demonstrated writing ability. Spring only. 3 units.

104. Metamorphic Petrology. The origin, classification, chemical and physical characteristics of metamorphic rocks. Determination of physical, chemical and tectonic environments during metamorphism. Emphasis in the laboratory will be on hand specimen and thin section observation and interpretation. Lecture one hour, laboratory three hours. Fee Course. Prerequisite: GEOL 102. Spring only. 2 units.

105. Paleontology. Morphology, classification, phylogeny, and paleoecology of important groups of fossil organisms. Field trip. Fee course. Lecture two hours; laboratory three hours. Fee course. Prerequisites: GEOL 10, 12. Spring only. 3 units.

106. Optical Crystallography and Mineralogy. The application of optical crystallography to the microscopy of non-opaque minerals, using the polarizing microscope on thin sections and on fragments in immersion oils. Lecture two hours, laboratory three hours. Prerequisites: GEOL 100; PHYS 5B or 11B, may be taken concurrently; or permission of the instructor for non-geology majors who have had CHEM 1A, 1B, and PHYS 5B or 11B. 3 units.

107. Applied Geology. The application of geology to such topics as groundwater, civil engineering, petroleum, and metallic and non-metallic resources. Topics may vary from year to year. Field trip. Fee Course. Prerequisites: GEOL 10, 10L; CHEM 1A. 3 units.

110. Structural Geology. Analysis of stress and strain as it pertains to the origin and interpretation of folds, faults, joints, foliation, and other structural elements of rocks. Structural problems in lab and field. Interpretation of maps, cross-sections, block diagrams, Mohr diagrams, and stereonets. Lecture two hours; laboratory three hours. Fee course. Prerequisites: GEOL 10, 10L; 12, 100; 101, 103, 111 may be taken concurrently; PHYS 5A or 11A; MATH 29 or high school trigonometry; and proficiency using a personal computer. Fall only. 3 units.

111. Field Methods. An introduction to field descriptions of rocks, geologic mapping, plane table and alidade, observation, interpretation, and geologic report writing. The course consists of off-campus fieldwork. Fee course. Prerequisites: GEOL 10, 12, 101, 103, 120; all with grade “C-” or better; or permission of instructor. GEOL 103 may be taken concurrently. 2 units.

112. The Physics and Chemistry of the Earth. Introduction to the basic principles of seismology, earthquakes and heat flow. Study will include the gravitational, magnetic and electrical fields of the Earth. Also basic principles of isotope geology, and the origin, abundance, distribution and migration of the elements in the various parts of the Earth. Fee course. Prerequisite: GEOL 10. 3 units.

113. Volcanoes. The study of volcanic activity, plate tectonic settings of volcanoes, and the products of volcanic eruptions. Mechanisms of eruptions will be studied along with their hazards. Examples of ancient and recent volcanic eruptions and the effect on the global and local environments will be investigated. Field trip. Fee course. Prerequisite: GEOL 10 or equivalent. 3 units.

115. Stratigraphy. Interpretation of ancient stratigraphic successions, integrated with an introduction to research methods. Facies models. Classification and correlation of stratigraphic units. Relationships between stratigraphy and tectonics. Measuring stratigraphic sections. Lab emphasizes subsurface techniques. Field trip. Lecture two hours; laboratory three hours. Fee course. Prerequisites: GEOL 101, 103, 110, 112. GEOL 110 may be taken concurrently. Fall only. 3 units.

118. Earth Science Activities. Earth Science activities designed to illustrate some of the principles, methods, and applications of the Earth Sciences—Geology, Astronomy, Meteorology, and Oceanography. Fee course. Prerequisite: GEOL 8. 1 unit.

119. Field Mapping. Field mapping and interpretation of rocks and geologic structures, and report writing. The course consists of off-campus fieldwork. Fee course. Prerequisites: GEOL 102, 110, 111, 115, 120. 2 units.

120. Applied Geomorphology. Examination of landforms, weathering and erosional processes; extensive use of aerial photographs and topographic maps in the geologic interpretation of landforms. Laboratory three hours. Fee course. Field trips. Prerequisites: GEOL 101, concurrent enrollment is recommended. 1 unit.

121. Geology of California. A regional study of California and certain surrounding areas with regard to geologic development, plate tectonics, economic resources and geologic hazards. Lecture and field trips(s). Fee course. Prerequisite: GEOL 10 or equivalent. 3 units.
125. Metallic Ore Deposits. Origin, geology, and distribution of metallic ore deposits. Introduction to ore minerals. Exploration methods. Field trip. Fee course. **Prerequisites:** GEOL 100, CHEM 1A. 3 units.

127. Hydrogeology. This course presents fundamentals of groundwater flow, as influenced by topography and geology; geological aspects of groundwater supply, contamination, remediation, and protection of hydrogeological regions of the United States and their critical groundwater issues. Laboratory, homework and field exercises will be included. **Prerequisites:** CHEM 1A; GEOL 10, 10L, 12; MATH 26A or 30; PHYS 5A; or permission of instructor. 3 units.

130. Oceanography. A survey of geological, physical, chemical and biological oceanography including the sea floor; waves, tides, currents; the physical and chemical properties of seawater and their distribution in the sea; planktonic life and its relation to nutrients. 3 units.

140. Geology and the Environment. A course which applies geologic data and principles to situations affecting our environment. The geologic study of earthquakes, volcanoes, floods, landslides, groundwater and similar topics supplies the background data for lectures on land use and other social choices. Topics such as geopolitics and mineral supply provide a basis for understanding international politics, social costs, and world economics. Fee course. 3 units.

170. Geology of the Planets. A study of the Earth-like planets and satellites, and the meteorites, from the point of view of a geologist. The course will include a survey of geologic methods and the application of these methods to the study of cratering; volcanic activity; weathering; rock formation; landsliding; erosion by wind, water, and ice; faulting, and so forth; with emphasis on members of the Solar System other than the Earth. **Prerequisite:** an introductory Geology course; or permission of instructor. 3 units.

175. Earthquakes. The study of plate tectonic settings of earthquakes, faults and the generation of earthquakes. Examples of historic earthquakes, seismic hazards and damage will be investigated. An overview of earthquake precursors and probability studies will also be discussed. **Prerequisite:** an introductory Geology or Physics course. 3 units.

184. Geological Field Trip. A 10 day field trip to a region of outstanding geology. Attendance at preliminary meetings is required. Analysis and interpretation of geologic features is emphasized. **Note:** student should consult the geology department during the semester before planning to take the course. May be taken more than once for credit. Fee course. **Prerequisite:** GEOL 10 or other geology course with approval of instructor. Graded Credit/No Credit. 2 unit.

190. Seminar in Geology. When a sufficient number of qualified students apply, a seminar in some particular geological field will be conducted. Fee course. 1-4 units.

193. Special Topics in Geology. A series of advanced courses in selected geologic subjects. **Prerequisites:** preliminary course in the discipline. Fee course. 3 units.

193A. Regional Geology
193B. Vertebrate Paleontology
193C. Engineering Geology
193D. Structural Analysis

194. Geology — Related Work Experience. Supervised employment in a geology related company or agency. Placement is arranged through the Department of Geology and the Cooperative Education Program office. Requires completion of a three to six month work assignment and a written report. **Note:** Units may not be used to meet major requirements in Geology. **Prerequisite:** Open only to upper-division students with consent of the Geology Department Chair. Graded Credit/No Credit. 6-12 units.

195. Geology Internship. Supervised unpaid work experience in government or industry. Supervision is provided by the faculty instructor and responsible officials in the work situations. Open to all upper division geology majors with permission of instructor. Number of units earned depends on number of hours worked. Graded Credit/No Credit. 1-3 units.

196. Experimental Offerings in Geology. Offerings in various fields of geology in response to student demand. **Prerequisites:** appropriate upper division coursework and permission of instructor. 1-3 units.

197. Advanced Laboratory Techniques for Geology. Supervised individual instruction on techniques applied in geology laboratories for advanced research in mineralogy, petrology, geochemistry, geophysics, and paleontology. **Prerequisites:** appropriate upper division courses and permission of instructor. Graded Credit/No Credit. 1-3 units.

198. Senior Research. Selection, design and completion of a research project. A final written report is required. Progress reports may be required by the supervising instructor. Presentation of an oral report on the research project during the same or a subsequent semester is required of BS degree students. **Prerequisites:** senior standing and appropriate courses as determined by a departmental faculty committee. The proposed project must be approved by the department committee. 2 units.

199. Special Problems. Individual projects or special studies. The advisor and the faculty member concerned must approve the course. **Note:** open only to students judged competent to carry on individual work. 1-3 units.