

Earth and Environmental Sciences

Advising Notes for the Natural Sciences Major

1. Substitutions may be made with the permission of the appropriate department chair. PHYS 4A-B-C with labs 4AL, 4BL is recommended instead of PHYS 2A-B for those students well prepared for physics.
2. This total assumes that students in this option will maximize the 12 units required for the major that also may be applied to fulfill General Education requirements as follows: CHEM 1A (3 units), BIOL 1A (3 units), EES 168 (3 units), and MATH 75 (3 units). Consult your major adviser for details.
3. Students should be sure to take sufficient upper-division units in their General Education courses and electives to satisfy the graduation requirements of 40 upper-division units and upper-division writing skills.

Graduate Program in Geology

The Department of Earth and Environmental Sciences offers graduate courses and research leading to the Master of Science. The graduate courses and research areas are such that several different career goals can be met, including the following: (1) preparation for enrollment in a Ph.D. program in geology or a related field, (2) preparation for employment as a professional geoscientist with industry or government, and (3) advancement of knowledge of the earth sciences and teaching skills of secondary school and junior college teachers.

Graduate research opportunities are available in several fields, including but not restricted to hydrology/hydrogeology/hydrogeochemistry, stream restoration, geophysics, tectonics, engineering geology, geomorphology, structural geology, volcanology/igneous and metamorphic petrology, sedimentology/paleontology/stratigraphy, paleoclimatology and high temperature, and stable isotope geochemistry.

The graduate program also offers research opportunities in applied geology. This curriculum is usually interdisciplinary with an environmental focus, involving coursework in geology, civil engineering, chemistry, soil sciences, and other areas. Two applied geology emphases are offered: (1) engineering and environmental geology and (2) hydrogeology. Students of applied geology are encouraged to undertake theses involving support and supervision by professionals in private and public sectors.

University requirements are met through satisfactory completion of core courses and specialty courses in the curriculum emphasis.

Students are required to pass the writing component of EES 201. Please see the department's graduate program policy and graduate program coordinator for more information.

Master of Science Degree Requirements

The graduate program for the Master of Science in Geology assumes as its foundation the equivalent of the undergraduate major in geology at California State University, Fresno. Two-thirds of the 30 units required for the degree must be in geology, and at least 21 of the 30 units must be 200-series courses. Students will select a thesis adviser to guide their research. The thesis adviser will also guide the selection of coursework in the program. For additional details regarding such requirements and procedures, please see the geology graduate program coordinator and the department's graduate program policy statement; for general requirements see *Division of Graduate Studies*. (See also *Admission to Graduate Standing, Advancement to Candidacy, Program Requirements, Foreign Language Requirements, and Criteria for Thesis and Project*.)

Course Requirements: Under the direction of his/her thesis adviser, and with approval by the department faculty, each student prepares and submits an individually designed program. Most coursework is elective in nature, in keeping with the department's philosophy that flexibility enables students to develop a path of study best suited to their goals. The course requirements are as follows:

	<i>Units</i>
EES 201 (Seminar in Geology)	3
EES 299 (Thesis)	6
Approved upper-division or graduate course electives in geology or related fields such as biology, chemistry, physics, engineering, and mathematics. Electives determined in consultation with graduate adviser	21
Total	30

Students studying applied geology should take the following courses before or during their graduate experience: EES 114, 117, 124.

Modifications in the program of study may be made with approval of both the thesis adviser and graduate program coordinator.

Additional Requirements. A master's thesis is required. An oral defense of a thesis proposal is required, to ensure that students have selected a problem that is commendable to an M.S. thesis in the sciences and that the proposed methods of analysis are appropriate to the task. This defense normally will be scheduled as a culminating experience in EES 201, but also can be scheduled outside of EES 201 if necessary. An oral defense of the thesis is also required. The defense will include questions regarding the thesis and questions of a more general nature related to knowledge in the earth sciences. The thesis will be judged by the extent to which a student attempts to solve a scientific problem by employing methods appropriate to the task. The thesis must meet certain minimum standards, which include the following: thoughtful consideration of and reference to prior work in the field of study; a peripheral understanding of the broader scientific value or societal implications of the work, as appropriate; and a demonstration of originality and critical thinking. Graduate students of geology conducting research in a foreign country are expected to be proficient in the language in which source materials are published.

COURSES

Earth and Environmental Sciences (EES)

EES 1. Natural Disasters and Earth Resources (4)

Prerequisite: G.E. Foundation B4 (except for those with declared major in the College of Science and Mathematics). Recommended: MATH 4R or second-year high school algebra. Processes and materials that produce the different geologic resources and hazards (earthquakes, volcanoes, floods, landslides). Plate tectonic theory (including continental drift) as the unifying model to explain geologic phenomena. Emphasizes the relationship between geology and humans. G.E. Breadth B1. (3 lecture, 2 lab hours; optional field trips) (Formerly GEOL 1)

EES 2. Historical Geology (3)

Prerequisites: EES 1. Origin and evolution of solid earth, life, oceans, and atmosphere as revealed by the rock record's fossil remains with emphasis on the evolution of life and the physical environment. (2 lecture, 2 lab hours) (Formerly GEOL 2)