The GS Major Curriculum

The purpose of the undergraduate program in Geological Sciences is to provide students with (1) a broad background in the fundamentals of the Earth sciences and (2) the quantitative, analytical, and communications skills necessary to conduct research and think critically about questions involving the Earth. The major provides excellent preparation for graduate school and careers in geological and environmental consulting, land use and planning, law, teaching, and other professions in which an understanding of the Earth and a background in science are important.

GS CORE COURSES (34-36 units)
All of the following:
- GS 1A, B, or C Introduction to Geology 3-5
- GS 4 How to Build and Maintain a Habitable Planet: An Introduction to Earth System History 4
- GS 90 Introduction to Geochemistry 3-4
- GS 102 Earth Materials: Introduction to Mineralogy 4
- GS 103 Earth Materials: Rocks in Thin Section 3
- GS 104 Introduction to Petrology 4
- GS 105 Introduction to Field Methods (June/July) 3
- GS 150 Senior Seminar (WIM) 3
- GS 190 Advanced Field Research 4+ weeks* 6

MATHEMATICS (10-20 units)
Either of the following equivalent series (10 units)
- Math 19, 20, 41 Calculus or Math 41, 42 Calculus or a score of 4 or 5 on the Calculus BC exam
AND at least two of the following:
- CME 100 Vector Calculus for Engineers or Math 51 5
- CME 102 ODEs for Engineers or Math 52 5
- CME 104 Linear Algebra and PDEs for Engineers or Math 53 5

CHEMISTRY (3-13 units)
- Chem 31A, B Chemical Principles I & II 10
  or Chem 31X Chemical Principles (accelerated) 4
  or a score of 4-5 on the Chemistry AP exam
AND one of the following:
- GS 171 Geochernical Thermodynamics 3
- Chem 135 Physical Biochemistry 3
- Chem 171 Physical Chemistry 3

Students may choose between introductory sequences in biology and physics. This choice should be made after discussion with an advisor and based on a student’s interests.

BIOLOGY OR PHYSICS (8-13 units)
EITHER one of the following:
- Bio 41 Genetics, Biochem. & Molecular Bio. 5
- Bio 44X Core Molecular Biology Lab 5
AND one of the following:
- Bio 42 Cell Biology & Animal Physiology 5
- Bio 43 Plant Biology, Evolution, and Ecology 5
- Bio 44Y Core Plant Biol. & Eco Evo Laboratory 5
- Bio 105 A&B Ecology and Natural History of Jasper Ridge Biological Preserve 8
OR
Any of the following three series
- Physics 21 Mechanics and Heat 3
- Physics 22 Mechanics and Heat Lab 1
- Physics 23 Electricity and Optics 3
- Physics 24 Electricity and Optics Lab 1
  or
- Physics 41 Mechanics 4
- Physics 43 Electricity and Magnetism 4
- Physics 44 Electricity and Magnetism Lab 1
  or
- Physics 41 Mechanics 4
- Physics 45 Light and Heat 4
- Physics 46 Light and Heat Lab 1

GS BREADTH (19-25 units)
Choose seven upper-level courses, one from each of the following groups as indicated. Courses with * are offered every other year.

5 Surface Processes (choose one)
- GS 130 Soil Physics and Hydrology 3
- GS 131 Hydrologically-Driven Landscape Evolution 3
- ESS 155 Science of Soils 4
- Geophys 190 Near-Surface Geophysics 3

Biogeosciences (choose one)
*GS 123 Introduction to Paleobiology
- GS 128 The Evolutionary History of Terrestrial Ecosystems 4

Earth Materials and Geochemistry (choose one)
*GS 163 Introduction to Isotope Geochemistry 3
- GS 170 Environmental Geochemistry 3
*GS 180 Igneous Processes 4
*GS 185 Volcanology 4

Sedimentary systems (choose one)
- GS 151 Sedimentary Geology and Petrology 4

Geodynamics (choose one)
- GS 107 Journey to the Center of the Earth 3
- Geophys 110 Earth on the Edge: Introduction to Geophysics 3
- Geophys 120 Ice, Water, Fire 3-5
- Geophys 130 Introductory Seismology 3

For more information: visit earth.stanford.edu/gs
or contact Professor Kate Maher (kmaher@stanford.edu) Director of Undergraduate Studies, 221 Green Earth Sci.
or Sara Cina (saracina@stanford.edu) Undergraduate Program Director, Bldg 320-112, 724-8899
GES BREADTH IN THE MAJOR (continued)

Structural geology and tectonics (choose one)
GS 110 Structural Geology and Tectonics 5
GS 111 Fundamentals of Structural Geology 3

Geospatial statistics and computer science (choose one)
CS 106A Programming Methodology 3-5
Earth 211 Software Development for Scientists and Engineers 3
Energy 125 Modeling and Simulation for Geoscientists and Engineers 3
Energy 160 Modeling Uncertainty in the Earth Sciences 3
ESS 164 Fundamentals of Geographic Information Science (GIS) 4
Geophys 112 Exploring Geosciences with MATLAB 3

DEPTH IN THE MAJOR
Students must take 10 units of electives primarily drawn from the list above and other upper-level courses in GS (including graduate-level courses). Additional courses in Geophysics, ESS, and ERE may be counted towards the elective units if they allow a student to pursue a topic in depth; these options should be discussed with an advisor. A maximum of 3 of the elective units may be fulfilled by GS 192, 197, 198, or advanced seminars. Honors research (GS 199) may fulfill up to 4 elective units.

The GS Minor Curriculum

The minor in Geological Sciences is appropriate for students with a wide range of interests and backgrounds. To accommodate the variety of students who are interested, the minor program consists of a four-course core broadened by 12 units of electives. All students pursuing a minor in GS are encouraged (but not required) to participate in the Introduction to Field Methods (GS 105) which takes place during the two and half weeks immediately following commencement, and the GS Senior Seminar (GS 150).

CORE REQUIREMENTS (14-15 units)
GS 1A, B, or C An Introduction to Physical Geology 4-5
GS 4 How to Build and Maintain a Habitable Planet: An Introduction to Earth System History 4
GS 102 Earth Materials: Introduction to Mineralogy 3
GS 104 Earth Materials: Introduction to Petrology 3

Expanding the discipline: Electives
Students must take a minimum of 12 additional units drawn from the “Breadth in the Discipline” list in the GS major. Up to 3 units of Stanford Introductory Seminar courses in GS may be used to fulfill elective units for minors. A majority of units must be from classes within the GS department.

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