Geology and Geophysics

The Wiess School of Natural Sciences

Chair
Alan Levander

Professors
John B. Anderson
Hans G. Avé Lallemant
Richard G. Gordon
William P. Leeman
Dale S. Sawyer
Manik Talwani
Peter R. Vail

Associate Professors
André W. Droxler
Andreas Luttge
James E. Wright

Assistant Professors
Adrian Lenardic
Julia Morgan
Colin A. Zelt

Adjunct Professors
K. K. Bissada
Carlos A. Cramez
R. A. Donelick
Jeffrey J. Dravis
Robert B. Dunbar
M. Turhan Taner
John C. Van Wagoner
James L. Wilson

Adjunct Associate Professors
Gianni Matteucci
James Pindell
W. C. Rusty Riese

Adjunct Assistant Professors
Andrew L. Kurkjian
Paul D. Spudis
Gabor Tari

Degrees Offered: B.A., M.A., Ph.D.

The undergraduate program in geology focuses on a strong core of courses in all areas of earth materials, processes, and history as well as in allied sciences. Students also gain experience with analytical equipment, computer systems, and in fieldwork. The undergraduate geophysics major combines courses that apply physics to the study of the earth’s interior with course work in geology and mathematics. The program emphasizes computer techniques and work in the department’s seismic processing center. A second major can lay the foundation for a career in environmental geology, and students may also acquire certification in earth science as a teaching field.

Advanced graduate work is available in marine geology and oceanography, stratigraphy, carbonate and siliciclastic sedimentology, igneous and metamorphic petrology, geochemistry, structural geology, regional tectonics, reflection and crustal seismology, and geodynamics. Ideally, programs of study and research incorporate more than one of these specialties.

Degree Requirements for B.A. in Geology

For general university requirements, see Graduation Requirements (pages 17–19). Students completing the B.A. program should have a total of at least 129 hours at graduation. Students majoring in geology must complete the following:
Geology
GEOL 101 The Earth
(or GEOL 102 Evolution of the Earth
or GEOL 107 Oceans and Global Change
or GEOL 108 Crises of the Earth)
GEOL 105 Introductory Lab for Geological Sciences
GEOL 311 Mineralogy and Optics
GEOL 312 Petrology
GEOL 331 Structural Geology
GEOL 332 Sedimentology
GEOL 334 Geological and Geophysical Techniques
GEOL 390 Field Geology
GEOL 442 Exploration Geophysics
(or GEOL 446 Solid Earth Geophysics)

Math and Other Sciences
MATH 101 and 102 Single Variable Calculus I and II
MATH 211 Ordinary Differential Equations and Linear Algebra
CHEM 121 and 122 General Chemistry with Laboratory
(or CHEM 151 and 152 Honors Chemistry with Laboratory)
PHYS 101 or 111 Mechanics
PHYS 102 or 112 Electricity and Magnetism
NSCI230 Computation in Natural Science
(or CAAM 210 Introduction to Engineering Computation (C) or CAAM 211 Introduction to Engineering Computation (F) or COMP 210 Introduction to Principles of Scientific Computation)

Required Electives. Majors must also complete at least 12 hours in additional science and engineering courses at the 300 level or higher from an approved list; double majors must complete only 6 hours.

Environmental Geology. Students interested in careers in environmental geology are encouraged to take some of the following courses as electives:

GEOL 353 Environmental Geochemistry
GEOL 326/426 Environmental Geology
GEOL 451 Analysis of Environmental Data
ENVI 306 Global Environmental Law and Sustainable Development
ENVI 401 Introduction to Environmental Chemistry
ENVI 406 Introduction to Environmental Law
ENVI 412 Hydrology and Watershed Analysis

In addition, students may consider a second major in environmental science and engineering.

Degree Requirements for B.A. in Geophysics

For general university requirements, see Graduation Requirements (pages 17–19). Students completing the B.A. program should have a total of at least 129 hours at graduation. Students majoring in geophysics must complete the following:

Geology
GEOL 101 The Earth
(or GEOL 102 Evolution of the Earth
or GEOL 107 Oceans and Global Change
or GEOL 108 Crises of the Earth)
GEOL 105 Introductory Lab for Geological Sciences
GEOL 311 Mineralogy and Optics
(or GEOL 332 Sedimentology)
GEOL 331 Structural Geology
GEOL 334 Geological and Geophysical Techniques
GEOL 390 Field Geology
GEOL 461 Seismology I
GEOL 442 Exploration Geophysics
GEOL 444 Reflection Seismic Data Processing Lab
GEOL 446 Solid Earth Geophysics
(or GEOL 441 Geophysical Data Analysis
or GEOL 462 Tectonophysics
or GEOL 464 Global Tectonics)
Math and Other Sciences

MATH 101 and 102 Single Variable Calculus I and II
MATH 211 Ordinary Differential Equations and Linear Algebra
MATH 212 Multivariable Calculus
CHEM 121 and 122 General Chemistry with Laboratory
(or CHEM 151 and 152 Honors Chemistry with Laboratory)
PHYS 101 or 111 Mechanics

PHYS 102 or 112 Electricity and Magnetism
PHYS 201 Waves and Optics
PHYS 231 Elementary Physics Lab II
NSCI 230 Computation in Natural Science
(or CAAM 210 Introduction to Engineering Computation (C) or CAAM 211 Introduction to Engineering Computation (F) or COMP 210 Introduction to Principles of Scientific Computation)

Undergraduate Independent Research

The department encourages, but does not require, both geology and geophysics undergraduate majors to pursue independent supervised research in GEOL 481–482 Senior Research in Geology or Geophysics or GEOL 491–492 Special Studies. See also Honors Programs (page 34).

Degree Requirements for M.A. and Ph.D. in Geology and Geophysics

All incoming students should have a strong background in physics, chemistry, and mathematics and should have, or should acquire, a broad grounding in fundamental earth sciences. The department encourages applications from well-qualified students with degrees in the other sciences and mathematics.

For general university requirements, see Graduate Degrees (pages 71–72). The requirements for the M.A. and Ph.D. in geology and geophysics are similar, but the Ph.D. demands a significantly higher level of knowledge, research skills, and scholarly independence. Most students need at least two years beyond the bachelor’s degree to complete the M.A. and at least two years beyond the M.A. degree for the Ph.D.

Candidates determine with their major professor and advisory committee a course of study approved by the department Graduate Committee, following the Guidelines for Advanced Degrees in the Department of Geology and Geophysics distributed to all incoming students. For both degrees, candidates must:

• Complete 20 semester hours of course work at the 400 level and above (or other approved courses), not including research hours
• Maintain a grade point average of 3.00 (B) or better
• Prepare a thesis proposal during their second semester (no later than their third)
• Pass an oral qualifying exam based on the proposal before beginning research
• Produce a publishable thesis that represents an original contribution to science
• Defend the research and conclusions of the thesis in an oral examination

Students of exceptional ability with a bachelor’s degree and department approval may work directly toward the Ph.D., in which case the course of study is equivalent to that required for both degrees; performance on the examinations and the thesis, however, should be at the level required for the Ph.D.

Because the graduate programs require full-time study and close interaction with faculty and fellow students, the department discourages students from holding full- (or nearly full-) time jobs outside the university.

Financial Assistance. Teaching assistantships and research assistantships (which do not obligate a student to specific research projects) are available for the first year of study, during which students select an adviser and a research project. In the second and subsequent years, students normally receive, from external funds, a stipend and tuition for specific research.

See GEOL (pages 352–357) in the Courses of Instruction section.