Bachelor of Science in Geosciences

The Bachelor of Science in Geosciences (BSGS) serves as a professional degree for students planning careers as geologists, geophysicists, or teachers, as well as for those planning to pursue graduate work in geosciences or a profession such as law or business. Careers are available in the petroleum and related energy industries, resource evaluation, mineral exploration, geologic hazard monitoring, environmental control and reclamation, building foundation evaluation, groundwater contamination studies, soil testing, regional planning, watershed management, climate modeling, and college or secondary school teaching. Graduates may also work in state or federal agencies, in universities or museums, with consulting firms, or with service companies to the energy and mineral industries.

Degree requirements are divided into three categories: 1) university-wide undergraduate degree requirements (the University core curriculum) and flag requirements, 2) prescribed work for the degree, and 3) major requirements. Taken together, these courses constitute a degree major, a degree plan with a particular concentration or emphasis. Thus, students may develop intellectually challenging yet different plans of study according to their personal interests and goals.

Students seeking the Bachelor of Science in Geosciences degree must choose one of five majors: General Geology, Geophysics, Hydrology and Water Resources, Climate System Science, or Geosciences.

Majors

General Geology

In the General Geology Major, we focus on understanding what rocks can tell us about the processes that control our complex planetary system. We teach the tools, critical thinking, and spatial reasoning skills that are needed to decipher Earth's history, and we explore the range of approaches, from field to experiment to computation to remote sensing. To achieve these goals, we emphasize experiential learning; a hallmark of the major is participation in immersion courses, where students spend extended periods of time on project work, in a field or lab setting. Our graduates are ready to generalize, apply, and communicate their knowledge in the private, public, and academic sector, setting them up to solve societally relevant problems within the geosciences and beyond.

Geophysics

In the geophysics major, we study the dynamics and structure of the Earth and other planets using observational, forward, and inverse modeling approaches. Topics include environmental studies, marine processes, hydrology, glaciology, volcanoes, earthquakes, tectonics, impacts, resources, shallow hazards, and convection of planetary mantles. From global studies to microscopic scales, and from processes happening on timescales of seconds to billions of years, geophysicists contribute fundamental insights into physical processes and properties of the Earth. With a geophysics degree, students are well-equipped to solve cutting-edge problems in a wide range of disciplines, from fundamental Earth and climate science research to applications in the energy sector, data science and technology, and national security.

Hydrology and Water Resources

In the hydrology and water resources major, we teach the physical and chemical principles underlying Earth's water cycle to prepare to solve challenges related to water resources. Hydrology majors study the fundamentals of surface and subsurface flow and transport, thermodynamics, and water chemistry that impact the occurrence, distribution, and quality of water in the atmosphere, on the land surface, within biomass, and in soil and aquifers. Independent inquiry, data analysis, and experiential learning are emphasized through laboratories, field trips, research projects, and an immersion course focused on field methods and field applications of hydrologic science. Students prepare for technical roles in environmental industries and government agencies, as well as graduate study.

Climate System Science

The Climate System Science curriculum consists of three set of classes that are designed to develop students' quantitative and analytical skills as they learn about the climate system. The scientific study of the climate system requires strong preparation in mathematics - including calculus and statistics - as well as physics and chemistry. students will be prepared to work in any field that requires the ability to digest information about complex systems, including skills in handling and extracting meaning from large amounts of data. The option is also compatible with preparation for graduate school with judicious selection of upper-division classes and technical electives.

Geosciences

In the geosciences major, we offer a teaching track that prepares students to teach at the middle school or secondary school level in Texas. We study geosciences but also take courses in biological science, pedagogy, and student teaching. The major is part of the innovative UTeach program at UT Austin, which prepares students for science teaching certification in the state of Texas.

Prescribed Work Common to All Geosciences Majors

A total of 126 hours of coursework including Core Curriculum, prescribed work, and major work is required. All students must complete the University's core curriculum. The specific degree requirements consist of prescribed work, major requirements, and electives. In some cases, a course that is required for the degree may also be counted toward the core curriculum.

A course in one prescribed work area may not also be used to fulfill the requirements of another prescribed work or major requirement; the only exception to this rule is that a course that fulfills any other requirement may also be used to fulfill a core curriculum requirement, or a flag requirement if the course carries that flag, unless otherwise specified.

In the process of fulfilling the core curriculum and other degree requirements, all students are expected to complete the following Skills and Experience flags:

a. Writing: two flagged courses beyond Rhetoric and Writing 306 or its equivalent; students in the College of Natural Sciences and the Jackson School of Geosciences must complete only two flagged writing courses. For students in the College of Natural Sciences and the College of Liberal Arts, at least one writing flag must be from an upper-division course.
b. Quantitative reasoning: one flagged course.
c. Global cultures: one flagged course.
d. Cultural diversity in the United States: one flagged course.
e. Ethics: one flagged course.
f. Independent inquiry: one flagged course.

Flags may be added to courses periodically; courses that may be used to fulfill flag requirements are identified in the Course Schedule. Students

are encouraged to discuss options for completing flag requirements with their academic advisor.

GPA Requirements: A cumulative grade point average of at least 2.00 is required on all work undertaken at the University for which a grade or symbol other than Q, W, X, or CR is recorded. In addition, a grade point average of at least 2.00 is required in geological sciences courses counted toward the major requirement.

Course Grades: A grade of at least C- is required in each course used to fulfill any of the requirements for the degree. The official grade in a course is the last one made; however, if a student repeats a course and has two or more grades, all grades and all semester hours are used to calculate the University grade point average and to determine the student's scholastic eligibility to remain in the University and the student's academic standing in the Jackson School of Geosciences.

In-residence Coursework: All University students must complete at least 60 semester hours of the coursework counted towards the degree in residence. Individual degree(s) or degree options may contain additional course residency requirements. Every student in the BS Geosciences Majors must complete at least 36 semester hours of upper-division coursework in residence at the University.

In addition, the student must fulfill the University's general requirements and the requirements of the Jackson School of Geosciences.

Additional Requirements Specific to the BS Geosciences, Majors in General Geology, Geophysics, Hydrology and Water Resources and Climate System Science

BS Geosciences

Major: General Geology

Major Requirements

a. Mathematics 408C and 408D; or 408K, 408L, and 408M. Algebra courses at the level of Mathematics 301 or the equivalent may not be counted toward the total number of semester hours required for the degree.
b. Physics 301, 101L, 316, and 116L; or Physics 303K, 105M, 303L, and 105N.
c. Chemistry 301 and 302.
d. Introduction to Earth and Planetary Science Component: Choose one (3-4 Credits): A introductory exposure to geosciences in the 21st Century and foundational techniques required to study processes on Earth and other planets. Geological Sciences 401, 302C, 302D, 302E, 302G, 302J, 302M, 302N, 302Q, 303, 303C, or 303E.
e. Experiential Learning Component: Choose two (6-8 credits): Courses that develop skills in observation, data gathering, and interpretation in the field and/or laboratory. Geological Sciences 405, 310T, 315L, or 420K.
f. Disciplinary Breadth Component: (12 credits). These courses that span all aspects of geosciences at a sophomore level and provide the foundation to pursue courses at the advanced level. All geoscience students regardless of major are required to take these courses that span from the interior planetary processes to the climate system Geological Sciences 416E, 416S, and 416W.
g. Quantitative Analysis Component: Choose two (6 Credits): Courses that develop skills in the quantitative analysis of geosciences data and theories, including geostatistics, mathematics, numerical modeling, computer coding, and data analysis. The selection of courses includes courses where quantitative analysis of data and theories is the primary emphasis. Geological Sciences 325G, 352P, 325M, 378D, 366M, 322E, and/or Petroleum and Geosystems Engineering 338.
h. Geospatial Skills Component: Choose one course (3-4 credits). Courses that teach 3-D visualization and thinking skills and instruct in geospatial technologies and software. Geological Sciences 327G or 455S.
i. Immersion Learning Component: Choose two courses (6 credits). Intensive three week courses that require full time participation. Often, but not always, they occur off campus. Data acquisition and interpretation are a core component of these experiences. Geological Sciences 660A, 660B, 348K, and/or GEO 376L.
j. Disciplinary Fundamentals Component: (15-16 credit hours of which nine credit hours must be upper-division). Courses that survey the discipline at the advanced level, building upon introductory coursework, while also providing fundamental knowledge required for other advanced courses. Students will be guided through Areas of Study that are a suggested menu of courses for students interested in different aspects of Fundamentals appropriate for sub-disciplines and key topical subjects.

Major: Geophysics

Major Requirements

a. Mathematics 408C and 408D; or 408K, 408L, and 408M. Algebra courses at the level of Mathematics 301 or the equivalent may not be counted toward the total number of semester hours required for the degree.
b. Physics 301, 101L, 316, and 116L; or 303K, 105M, 303L, and 105N.
c. Chemistry 301 and 302.
d. Mathematics 427J and Mathematics 427L.
e. Physics 315 and Physics 115L.
f. Introduction to Earth and Planetary Science Component: Choose one (3-4 credits). An introductory exposure to geosciences in the 21st Century and foundational techniques required to study processes on Earth and other planets. Geological Sciences 401, 302C, 302D, 302E, 302G, 302J, 302M, 302N, 302Q, 303, 303C, or 303E.
g. Experiential Learning Component: Choose one (3-4 credits). Courses that develop skills in observation, data gathering, and interpretation in the field and/or laboratory. Geological Sciences 405, 310T, 315L, or 420K.
h. Disciplinary Breadth Component (12 credits) These courses that span all aspects of geosciences at a sophomore level and provide the foundation to pursue courses at the advanced level. All geoscience students regardless of major are required to take these courses that span from the interior planetary processes to the climate system. Geological Sciences 416E, 416S, and 416W.
i. Quantitative Analysis Component: Choose one (3 credits). Courses that develop skills in the quantitative analysis of geosciences data and theories, including geostatistics, mathematics, numerical modeling, computer coding, and data analysis. The selection of courses includes courses where quantitative analysis of data and theories is the primary emphasis. Geological Sciences 325G, 352P, 378D and/or Petroleum and Geosystems Engineering 338.
j. Geophysics Component 1: (10 credits) Geological Sciences 114G, 325C, 325K, and 354.
k. Geophysics Component 2: Choose 2 (7 credits). Geological Sciences 365P, 366M, and/or 465K.
l. Immersion Learning Component: Choose two courses (6 credits). Intensive three week courses that require full time participation. Often, but not always, they occur off campus. Data acquisition and

interpretation are a core component of these experiences. Geological Sciences 660A, 660B, 348K, 376L, 661A, 661B, 679GA, 679GB.

m. Disciplinary Fundamentals Component: Choose two upper-division geological sciences courses (6 credit hours) that survey the discipline at the advanced level, building upon introductory course work, while also providing fundamental knowledge required for other advanced courses. Students will be guided through Areas of Study that are a suggested menu of courses for students interested in different aspects of the geosciences. Through these Areas of Study we encourage deeper learning in the Disciplinary Fundamentals appropriate for sub-disciplines and key topical subjects.

Major: Hydrology and Water Resources

Major Requirements

a. Mathematics 408C and 408D; or 408K, 408L, and 408M. Algebra courses at the level of Mathematics 301 or the equivalent may not be counted toward the total number of semester hours required for the degree
b. Physics 301, 101L, 316, and 116L; or Physics 303K, 103M, 303L, and 103N.
c. Chemistry 301 and 302. Together, requirements 2 and 3 also meet parts I and II of the science and technology requirement of the core curriculum.
d. Introduction to Earth and Planetary Science Component: Choose one (3-4 Credits): A introductory exposure to geosciences in the 21st Century and foundational techniques required to study processes on Earth and other planets. Geological Sciences 401, 302C, 302D, 302E, 302G, 302J, 302M, 302N, 302Q, 303, 303C, or 303E.
e. Experiential Learning Component: Choose two (6-8 credits): Courses that develop skills in observation, data gathering, and interpretation in the field and/or laboratory. Geological Sciences 405, 310T, 315L, or 420K.
f. Disciplinary Breadth Component: (12 credits) These courses that span all aspects of geosciences at a sophomore level and provide the foundation to pursue courses at the advanced level. All geoscience students regardless of major are required to take these courses that span from the interior planetary processes to the climate system. Geological Sciences 416E, 416S, and 416W.
g. Computational Component: Choose two courses (6 credits). Courses that develop skills in the quantitative analysis of geosciences data and theories, including geostatistics, mathematics, numerical modeling, computer coding, and data analysis as well as courses that teach 3-D visualization and thinking skills and instruct in geospatial technologies and software. The selection of courses includes courses where quantitative analysis of data or geospatial analysis is the primary emphasis. Geological Sciences 325G, 325M, 352P, 378D, 366M, and/or Petroleum and Geosystems Engineering 338.
h. Immersion Learning Component: (3 credits) Intensive three week courses that require full time participation. Often, but not always, they occur off campus. Data acquisition and interpretation are a core component of these experiences. Geological Sciences 376L.
i. Water, Climate, and Environmental Fundamentals Component: Choose two (6 credits) Geological Sciences 328W, 377P, 347D, 320S, 349C, 377K
j. Hydrogeology Component: three courses (11 credit hours) Geological Sciences 476K, 476M, 376S
k. Geological Sciences Component Electives: Choose three upper-division (9 credits) of geological sciences courses.
l. Disciplinary Fundamentals Component: Choose four courses (12 credit hours). Students will be guided through Areas of Study that are a suggested menu of courses for students interested in different aspects of the geosciences. Through these Areas of Study we encourage deeper learning in the Disciplinary Fundamentals appropriate for sub-disciplines and key topical subjects.

Major: Climate System Science

Major Requirements

a. Mathematics 408K, 408L, and 408M. Mathematics 408C or 408K also meets the mathematics requirement of the core curriculum. Algebra courses at the level of Mathematics 301 or the equivalent may not be counted toward the total number of semester hours required for the degree.
b. Physics 303K, 105M, 303L, and 105N.
c. Chemistry 301 and 302. Together, requirements 2 and 3 also meet parts I and II of the science and technology requirement of the core curriculum.
d. Statistics and Data Sciences 302F
e. Introduction to Earth and Planetary Science Component: Choose one (3-4 Credits): A introductory exposure to geosciences in the 21st Century and foundational techniques required to study processes on Earth and other planets. Geological Sciences 401, 302C, 302D, 302E, 302G, 302J, 302M, 302N, 302Q, 303, 303C, or 303E.
f. Experiential Learning Component: Choose two (6-8 credits): Courses that develop skills in observation, data gathering, and interpretation in the field and/or laboratory. Geological Sciences 405, 310T, 315L, or 420K.
g. Disciplinary Breadth Component: (12 credits) These courses that span all aspects of geosciences at a sophomore level and provide the foundation to pursue courses at the advanced level. All geoscience students regardless of major are required to take these courses that span from the interior planetary processes to the climate system. Geological Sciences 416E, 416S, and 416W.
h. Climate: 12 hours chosen from Geological Sciences 320S, 338W or 376S, 377P, or 347D.
i. Computational Component: Choose two courses (6 credits). Geological Sciences 325G, 327G, 352P, 378D.
j. Geological Sciences Component Electives: Choose five upper-division (15 credits) of geological sciences courses.

Major: Geosciences, Teaching track

The BS Geosciences, Geosciences Major, Teaching track is designed to fulfill the course requirements for composite science teacher certification for middle school or secondary with geological sciences as the primary teaching field.

Additional Requirements Specific to the BS Geosciences, Geosciences Major, Teaching track

Students must meet the following requirements to graduate and be recommended for certification.

- University grade point average of at least 2.50
- Earned a grade of at least *C-* in each of the professional development courses and supporting courses listed below as well as all coursework required for the geological sciences degree.
- Successful passing of final teaching portfolio review, conducted by the UTeach-Natural Sciences program. Information about the portfolio review and additional certification requirements is available from the UTeach-Natural Sciences academic advisor.

- Composite certification requires 24 semester hours of coursework in the primary field, 12 hours in a second field, and six hours each in two additional fields.
- In addition, students must fulfill the University's general requirements and the requirements of the Jackson School of Geosciences.

Students must adhere to the current certification requirements, even if they differ from those listed in the University catalog.

Prescribed Work

a. Professional Development Sequence:
   i. Curriculum and Instruction 651S
   ii. Curriculum and Instruction 365C or UTeach-Natural Sciences 350
   iii. Curriculum and Instruction 365D or UTeach-Natural Sciences 355
   iv. Curriculum and Instruction 365E or UTeach-Natural Sciences 360
   v. UTeach-Natural Sciences 101, 110, and 170
b. Supporting Courses:
   i. Biology 337 (Topic 2: *Research Methods: UTeach*), Chemistry 368 (Topic 1: *Research Methods: UTeach*), or Physics 341 (Topic 7: *Research Methods: UTeach*)
   ii. History 329U or Philosophy 329U
c. Middle grades certification: Students seeking middle grades certification, must also complete the following coursework:
   i. Educational Psychology 350G, or both Psychology 301 and 304
   ii. Curriculum and Instruction 339E

Major Requirements

a. Mathematics 408C. This course also meets the mathematics requirement of the core curriculum. Algebra courses at the level of Mathematics 301 or the equivalent may not be counted toward the total number of semester hours required for the degree.

b. To meet the requirements of composite certification, the student must complete the following courses. In meeting this requirement, the student also fulfills parts I and II of the science and technology requirement of the core curriculum.
   i. Biology 311C and 311D
   ii. Chemistry 301 and 302
   iii. Physics 303K and 103M or Physics 303L and 103N; or an equivalent sequence
   iv. Enough additional approved coursework in biology, chemistry, or physics to provide the required 12 semester hours in a second field
c. Astronomy 303, 307, or 367M
d. Marine Science 307
e. Geological Sciences 401 or 303, 405, 416K, 416M, and 420K or 320L
f. Enough upper-division coursework to total at least 28 semester hours in geological sciences.
g. Enough additional coursework to total 126 semester hours including core, prescribed and major work.