Hydrology and Water Resources (BSGS)

Degree-Bachelor of Science in Geosciences (BSGS)

The Bachelor of Science in Geosciences (BSGS) serves as a professional degree for students planning careers as geologists, geophysicists, hydrologists, climate scientists, 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),
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.

Component Notes

- **Introduction to Earth and Planetary Science Component:** A introductory exposure to geosciences in the 21st Century and foundational techniques required to study processes on Earth and other planets.
- **Experiential Learning Component:** Courses that develop skills in observation, data gathering, and interpretation in the field and/or laboratory.
- **Disciplinary Breadth Component:** 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.
- **Quantitative Analysis Component:** 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.
- **Geospatial Skills Component:** Courses that teach 3-D visualization and thinking skills and instruct in geospatial technologies and software.
- **Immersion Learning Component:** 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.
- **Disciplinary Fundamentals Component:** 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-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.

Admissions

Information about admissions to this program is given in the school's Admissions section.

Total Hours Required: 126

Plan of Study

The Plan of Study is a suggested four-year course sequence to support academic planning and serves as a helpful guide. Currently enrolled students should meet with their academic advisor to tailor their course selections and timelines to their individual goals and circumstances.

Course	Title	Hours
Year 1		
Semester 1		
Hours chosen from: Intro to Earth and Planetary Science course		3
M 408C	Differential and Integral Calculus	4
CH 301	Principles of Chemistry I	3
UGS 302 or UGS 303	First-Year Signature Course or First-Year Signature Course	3
RHE 306	Rhetoric and Writing	3
	Hours	**16**
Semester 2		
Humanities (040)		3
M 408D	Sequences, Series, and Multivariable Calculus	4
CH 302	Principles of Chemistry II	3
Hours chosen from: Experiential Learning Course		3
U.S. History (060)		3
	Hours	**16**
Year 2		
Semester 1		
Hours chosen from: Disciplinary Breadth course		8
PHY 303K	Engineering Physics I	3
PHY 105M	Laboratory For Physics 302K, 303K, and 317K	1
U.S. History (060)		3
	Hours	**15**
Semester 2		
Hours chosen from: Disciplinary Breadth course		4
Hours chosen from: Experiential Learning course		3
Free Elective		3
PHY 303L	Engineering Physics II	3
PHY 105N	Laboratory For Physics 302L, 303L, and 317L	1
Hours chosen from: Immersion Learning course		3
	Hours	**17**

Year 3		
Semester 1		
Hours chosen from: Quantitative Analysis course		3
Visual and Performing Arts (050)		3
GOV 310L	American and Texas Government	3
Hours chosen from: Upper-division Disciplinary Fundamental course		3
Free Elective		3
	Hours	**15**
Semester 2		
Hours chosen from: Upper-division Disciplinary Fundamental course		3
Hours chosen from: Quantitative Analysis course		3
GOV 312L	Issues and Policies in American Government	3
Free Elective		3
Hours chosen from: Hydrology Component course		4
	Hours	**16**
Year 4		
Semester 1		
Hours chosen from: Hydrology Component course		4
Hours chosen from: Water, Climate, and Environmental Fundamentals course		4
Hours chosen from: Upper-division Disciplinary Fundamental course		3
Social and Behavioral Sciences (080)		3
Free Elective		3
	Hours	**17**
Semester 2		
Hours chosen from: Hydrology Component course		3
Hours chosen from: Water, Climate, and Environmental Fundamentals course		3
Free Elective (upper-division)		3
Free Elective		5
	Hours	**14**
	Total Hours	**126**

Requirements

All requirements are listed below, starting with the most specialized moving to the most general. Additional requirements may follow the table, so be sure to read the entire page. Some required courses listed below may also satisfy General Education requirements, including Core Curriculum.

Code	Title	Hours
Major		
Choose a sequence below:		8
Sequence 1:		
M 408C	Differential and Integral Calculus	
M 408D	Sequences, Series, and Multivariable Calculus	
Sequence 2:		
M 408K	Differential Calculus	
M 408L	Integral Calculus	
M 408M	Multivariable Calculus	
Choose a sequence below:		8
Sequence 1:		
PHY 301	Mechanics	
PHY 101L	Laboratory for Physics 301	
PHY 316	Electricity and Magnetism	
PHY 116L	Laboratory for Physics 316	
Sequence 2:		
PHY 303K	Engineering Physics I	
PHY 105M	Laboratory For Physics 302K, 303K, and 317K	
PHY 303L	Engineering Physics II	
PHY 105N	Laboratory For Physics 302L, 303L, and 317L	
CH 301	Principles of Chemistry I	3
CH 302	Principles of Chemistry II	3
Introduction to Earth and Planetary Science Component		
Hours chosen from:		3
GEO 401	Physical Geology	
GEO 302C	Climate: Past, Present, and Future	
GEO 302D	Age of Dinosaurs	
GEO 302E	Earth, Wind, and Fire	
GEO 302G	Earth Science and Sustainability	
GEO 302J	Crisis of Our Planet	
GEO 302M	The Age of Mammals	
GEO 302N	Geology of National Parks	
GEO 302Q	Gems and Gem Minerals	
GEO 303	Introduction to Geology	
GEO 303C	Introduction to the Solar System	
GEO 303E	Earth in 2100	
Experiential Learning Component		
Hours chosen from:		6
GEO 405	Life through Time	
GEO 311D	Geodata	
GEO 315L	Earth From Lab to Planet	
GEO 420K	Introduction to Field and Stratigraphic Methods	
Disciplinary Breadth Component		
GEO 416E	Solid Earth Processes	4
GEO 416S	Earth and Planetary Processes Through Time	4
GEO 416W	Climate, Water, and the Environment	4
Quantitative Analysis Component		
Hours chosen from:		6
GEO 325G	Computational Applications in the Geosciences	
GEO 325M	Numerical Modeling in the Geosciences	
GEO 352P	Python for Geoscience Research	
GEO 378D	Introduction to Machine Learning and Geosciences	
GEO 366M	Mathematical Methods in Geophysics	
Immersion Learning Component		
GEO 376L	Field Methods in Groundwater Hydrology	3
Water, Climate, and Environmental Fundamentals Component		
Hours chosen from:		6
GEO 328W	Vadose Zone Hydrology	
GEO 377P	Physical Climatology	
GEO 347D	Global Warming	
GEO 320S	Introduction to Atmospheric Sciences	
GEO 349C	Introduction to the Cryosphere	
GEO 377K	Applied Karst Hydrogeology	
Hydrogeology Component		
GEO 476K	Groundwater Hydrology	4
GEO 476M	Aqueous Geochemistry	4
GEO 376S	Physical Hydrology	3
Disciplinary Fundamentals Component		
Hours chosen from: Upper-division GEO coursework		9
Subtotal		*78*
Degree		
Free electives: Additional coursework to reach total hours required.		12
Subtotal		*12*
General Education		
Remaining Core Curriculum (42 hours total)		36

Foreign Language other than English, Beginning Proficiency	
Subtotal	*36*
College Requirements - Geosciences	
General University Requirements	
Total Hours	**126**

Additional Requirements

At least 18 hours of upper-division coursework in geological sciences must be completed in residence.

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A course in one prescribed work area may not also be used to fulfill the requirements of another prescribed work or major requirement.

A grade point average of at least 2.00 is required in geological sciences courses counted toward the major requirement.

Algebra courses at the level of Mathematics 301 or the equivalent may not be counted toward the total number of hours for the degree.

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.

Individual degree(s) or degree options may contain course residency requirements in addition to University requirements. BSGS majors must complete at least 36 semester hours of upper-division coursework in residence at the University.