Geosystems Engineering (BSGE)

Bachelor of Science in Geosystems Engineering

Geosystems engineers are concerned with the development and use of engineering approaches in the management of natural resources from the earth's surface and subsurface. This degree program, offered jointly by the Cockrell School of Engineering and the Jackson School of Geosciences, is designed to teach students the geological and engineering principles needed to solve subsurface resource development and environmental problems. The curriculum includes a fundamental sequence of engineering and geological sciences courses in such areas as multiphase fluid flow, heat and mass transfer, field methods, and engineering design with applications to water and energy resources. This interdisciplinary systems approach, combining engineering and geological sciences, is increasingly required to address complex real-world problems such as geothermal energy, the mining of strategic minerals, geologic storage of CO2 captured from the atmosphere, and pollution remediation and management of aquifers. The degree program is designed to prepare graduates for successful careers with energy, environmental, and water resource management companies in addition to many government agencies. Graduates of the program may pursue graduate study in environmental engineering, petroleum engineering, geology, and other related fields.

Graduates are expected to understand the fundamental principles of science and engineering behind subsurface processes involved in energy and water resources to keep their education from becoming outdated and to give them the capability of self-instruction after graduation. They should also be prepared to serve society by applying the ideals of ethical behavior, professionalism, and environmentally responsible stewardship of natural resources.

Containing the following elements, the technical curriculum provides both breadth and depth in a range of topics.

- A combination of college-level mathematics and basic sciences (some with experimental work) that includes mathematics through differential equations, physics, chemistry, and geology
- Basic engineering and geologic topics that develop a working knowledge of fluid mechanics, strength of materials, transport phenomena, material properties, phase behavior, and thermodynamics
- Engineering and geosciences topics that develop competence in characterization and evaluation of subsurface geological formations and their resources using geoscientific and engineering methods, including field methods; design and analysis of systems for producing, injecting, and handling fluids; application of hydrogeologic and reservoir engineering principles and practices for water and energy resource development and management; contamination evaluation and remediation methods for hydrologic resources; and use of project economics and resource valuation methods for design and decision making under conditions of risk and uncertainty
- A major capstone design experience that prepares students for engineering and hydrogeologic practice, based on the knowledge and skills acquired in earlier coursework and incorporating engineering and geological standards and realistic constraints

Total Hours Required: 132

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		
CH 301	Principles of Chemistry I	3
GEO 303	Introduction to Geology	3
M 408C	Differential and Integral Calculus	4
RHE 306	Rhetoric and Writing	3
First-Year Signature Course (090)		3
	Hours	**16**
Semester 2		
CH 302	Principles of Chemistry II	3
M 408D	Sequences, Series, and Multivariable Calculus	4
PHY 303K	Engineering Physics I	3
PHY 105M	Laboratory For Physics 302K, 303K, and 317K	1
PGE 333T	Engineering Communication	3
U.S. History (060)		3
	Hours	**17**
Year 2		
Semester 1		
GEO 416E	Solid Earth Processes	4
GEO 416S	Earth and Planetary Processes Through Time	4
E M 306	Statics	3
M 427J	Differential Equations with Linear Algebra	4
	Hours	**15**
Semester 2		
E M 319	Mechanics of Solids	3
PGE 311	Numerical Methods and Programming	3
GEO 416W	Climate, Water, and the Environment	4
PGE 326	Thermodynamics and Phase Behavior	3
PHY 303L	Engineering Physics II	3
PHY 105N	Laboratory For Physics 302L, 303L, and 317L	1
	Hours	**17**
Year 3		
Semester 1		
GEO 476K	Groundwater Hydrology	4
PGE 322K	Transport Phenomena in Geosystems	3
PGE 323K	Reservoir Engineering I: Primary Recovery	3
PGE 424	Petrophysics	4
Social and Behavioral Sciences (080)		3
	Hours	**17**
Semester 2		
Engineering Technical Elective		3
GEO 420K	Introduction to Field and Stratigraphic Methods	4
PGE 334	Reservoir Geomechanics	3
PGE 358	Principles of Formation Evaluation	3
American and Texas Government (070)		3
	Hours	**16**
Semester 3		
GEO 376L	Field Methods in Groundwater Hydrology	3
	Hours	**3**
Year 4		
Semester 1		
PGE 430	Drilling and Well Completions	4
Geoscience Technical Elective		3
PGE 365	Resource Economics and Valuation	3
Engineering Technical Elective		3

Humanities (040)		3
	Hours	**16**
Semester 2		
PGE 373L	Geosystems Engineering Design and Analysis	3
Geoscience Technical Elective		3
American and Texas Government (070)		3
U.S. History (060)		3
Visual and Performing Arts (050)		3
	Hours	**15**
	Total Hours	**132**

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
Degree		
PGE 311	Numerical Methods and Programming	3
PGE 322K	Transport Phenomena in Geosystems	3
PGE 323K	Reservoir Engineering I: Primary Recovery	3
PGE 326	Thermodynamics and Phase Behavior	3
PGE 333T	Engineering Communication	3
PGE 334	Reservoir Geomechanics	3
PGE 358	Principles of Formation Evaluation	3
PGE 365	Resource Economics and Valuation	3
PGE 373L	Geosystems Engineering Design and Analysis	3
PGE 424	Petrophysics	4
PGE 430	Drilling and Well Completions	4
CH 301	Principles of Chemistry I	3
CH 302	Principles of Chemistry II	3
E M 306	Statics	3
E M 319	Mechanics of Solids	3
GEO 303	Introduction to Geology	3
GEO 376L	Field Methods in Groundwater Hydrology	3
GEO 416E	Solid Earth Processes	4
GEO 416S	Earth and Planetary Processes Through Time	4
GEO 416W	Climate, Water, and the Environment	4
GEO 420K	Introduction to Field and Stratigraphic Methods	4
GEO 476K	Groundwater Hydrology	4
M 408C	Differential and Integral Calculus	4
M 408D	Sequences, Series, and Multivariable Calculus	4
M 427J	Differential Equations with Linear Algebra	4
PHY 105M	Laboratory For Physics 302K, 303K, and 317K	1
PHY 105N	Laboratory For Physics 302L, 303L, and 317L	1
PHY 303K	Engineering Physics I	3
PHY 303L	Engineering Physics II	3
Approved engineering electives		6
Approved geosciences technical electives		6
RHE 306	Rhetoric and Writing	3
Free electives: Additional coursework to reach total hours required.		
Subtotal		*108*
General Education		
Remaining Core Curriculum (42 hours total)		24
Foreign Language other than English, Beginning Proficiency		
Subtotal		*24*
College Requirements - Engineering		
General University Requirements		
Total Hours		**132**

Additional Requirements and Policies

The student must take all courses applied to degree requirements on the letter-grade basis. Students must earn a grade of at least C- in each course, except for those listed as Remaining Core Curriculum courses. Students must also maintain grade point averages of at least 2.00 in the major area of study and in required technical courses as described in Academic Standards, and a cumulative University grade point average of at least 2.00 as described in the General Information Catalog.

Courses used to fulfill technical and nontechnical elective requirements must be approved by the petroleum and geosystems engineering faculty and the geological sciences faculty before the student registers for them.

Portable Computing Devices

Students entering Geosystems Engineering are required to have access to a portable computing device capable of running programs suitable for use in the classroom and on the university wireless network. The use of this device will be necessary in many required courses, and individual instructors may require the device be brought to class or lab sessions. For a list of minimum system requirements see https://www.pge.utexas.edu/undergraduate/advising/.

This program is accredited by the Engineering Accreditation Commission of ABET (Accreditation Board for Engineering and Technology).

ABET Student Objectives & Outcomes

In 3 to 5 years after graduation, program graduates will:

1. Be practical, employable and qualified geosystems engineers, who effectively solve problems and design new processes and workflows in subsurface environmental engineering and oil and gas production and services industries or other similar pursuits. Many will have started to move into leadership roles within their workplace.
2. Keep their education up-to-date through self-instruction and other training.
3. Serve society by encouraging the ideals of ethical behavior, professionalism, and environmentally responsible use of natural resources.

Graduates of the program must demonstrate:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.