

# DEPARTMENT OF ENVIRONMENTAL AND GEOSCIENCES

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## Mission

The primary mission of the Department of Environmental and Geosciences is to provide students of the complementary programs a comprehensive understanding of the range and depth of these scientific disciplines which encompass, respectively, environmental science and sustainability, the human and physical domains of geography, and the physical and historical domains of geology. This understanding is intended to enable our students to achieve their full potential as skilled professionals and well-qualified technical employees in a diverse range of companies and governmental organizations, and to become effective teachers and community leaders. Our programs enable students to become informed users of a range of technologies and prudent stewards of our natural resources. This understanding of the world will promote successful careers, active life-long learning, and an ability and desire to contribute positively to society.

## Highlights

Located on the third floor of the Lee Drain Building, the department maintains both a Geographic Information System (GIS) lab and a combination GIS and remote sensing lab. These labs contain state-of-the-art computers, software, and scanners. We also have a van for fieldtrips, a pickup truck and trailer used for field research, a coring device capable of taking up to 6m core samples, high-quality GPS receivers, a large-scale flume to demonstrate sedimentation processes, and a Ground Penetrating Radar System. In order to enhance learning, all of our rooms are outfitted with video-projection systems, and our lecture rooms have sound systems and dedicated computers with Internet access that are used by the instructors for teaching purposes. Many of our students obtain internships and work with faculty members on research projects.

## Academic Programs

### Geography Program

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Geography is an interdisciplinary field of study that provides students the skills and technical knowledge needed to address issues, challenges, and opportunities associated with how humans interact with their local and global environments. As an academic subject, it focuses on both the physical and cultural environments and incorporates the use and application of a host of geospatial technologies as a means to study and analyze these subject matters, such as geographic information systems (GIS), remote sensing, digital image processing, and global positioning systems. Geographers can study an exceptionally eclectic range of phenomena, including demographics, landforms, soil fertility, plant and animal wildlife, weather and climate, religion, language, ethnicity, urban planning, and international affairs, just to name a few. Geographers are behind the maps you use every day, as well as the policies that shape our cities, and the analysis that sustains and protects our environment. Geographers help shape the future design of cities and infrastructure. Geographers assess the impacts of rising sea levels, volcanic eruptions, floods, heat waves, and tropical storms, while others study impacts of wildfires or manage wetlands. Geographers investigate the environmental and economic impacts of tourism and gauge the cultural impacts of globalization. Geographers use cutting edge satellite data to explore alternative energy sources and assess natural resource utilization and population growth. Geographers also work directly with local people on socioeconomic issues such as health, migration, and housing affordability. Moreover, geographers play a vital role in teaching this eclectic subject matter in school districts across the nation and around the world. If you want to learn about and change our world, there is no better discipline for people who thrive on complex challenges and want to make a real impact on lives and our environment. In the age of global markets, global culture, global transportation systems, and global telecommunications, we are increasingly faced with the reality that our welfare is highly interdependent with the rest of the world. A geographic education represents an excellent way to understand how to deal with environmental, social, and economic issues associated with this reality. For an individual curious about the world and his or her place in it, few disciplines satisfy that curiosity as much as geography.

### Geography Concentrations

The Geography program incorporates a two-track curriculum and is designed to fit the particular academic interests of our students and better prepare them for life beyond SHSU, particularly in terms of graduate study or employment opportunities. Students majoring in geography focus their studies within one of two concentrations; 1) Environment, Culture, and Development, or 2) GIS (Geographic Information Science). Both concentrations are somewhat flexible and enable students to tailor their degree plans toward a mix of coursework most appropriate to their career goals. The Environment, Culture, and Development Concentration truly integrates the strengths of environmental and human geography, with the application of geospatial techniques. For example, students choosing this concentration matriculate through a degree that integrates scientific study of the environment with the perspectives of such topics as hydrology, conservation, culture, economic change, development, population, and public health, while gaining experience using geospatial techniques. Students choosing this concentration can pursue either Bachelors of Arts (BA) or Bachelors of

Science (BS) degrees. The GIS Concentration, available as a BS degree, is designed for students desiring more advanced and intensive training with a broad range of geospatial tools and technologies, such as Advanced GIS, Remote Sensing, and Digital Image Processing.

## Career Opportunities

Because of the breadth of geography, there are a wide variety of career opportunities for geography graduates. These opportunities include careers in the following:

- surveying and geomatics
- geophysics
- wetlands delineation
- water quality analysis
- photogrammetry
- urban planning
- computer mapping and geospatial technologies
- environmental companies and state environmental agencies
- state transportation departments
- city, county, state, and federal government
- education
- historical preservation
- marketing agencies
- energy companies
- emergency management and law enforcement
- tourism & travel writing
- military

Geography's focus on spatial relationships, in conjunction with new advances in technology, have led to the development of new geographical tools—principally Geographic Information Systems (GIS) and Global Positioning Systems (GPS)—that are now used by many geographers in a wide variety of fields. Because these technologies can be applied within virtually any field (government, business, military, etc.) it is one of the fastest growing job fields and the demand for people with experience using them exceeds the supply. Aside from offering a track with our program that emphasizes these technologies, we also offer students an Interdisciplinary Minor in GSS that emphasizes GIS, remote sensing and computer cartography. The combination of a geography major and a GSS minor is highly marketable. With their broad background, geography graduates have an ability to see connections where others do not, and this enables geographers to work in many different fields. Geography literally offers a world of opportunities.

- Master of Science in Geographic Information Systems (<http://catalog.shsu.edu/graduate-and-professional/college-departments/science-and-engineering-technology/environmental-geosciences/geographic-information-systems-ms/>)
- Graduate Certificate in Geographic Information Systems (<http://catalog.shsu.edu/graduate-and-professional/college-departments/science-and-engineering-technology/environmental-geosciences/geographic-information-systems-certificate/>)

## Student Organizations and Activities

- **Geographers of Sam Houston (GOSH)** - GOSH is intended to enhance appreciation for geography through club-sponsored field trips, guest lectures, and other activities, and to promote camaraderie among geography students.
- **Gamma Theta Upsilon (GTU)** - GTU is the National Geography Honor Society and was established to promote geographic awareness and the pursuit of geographic knowledge. To be eligible for membership in this honor society, students must have at least 12 hours of geography coursework, a minimum GPA of 3.25 in their geography coursework, and an overall GPA of at least 3.0.

## Internships

Educational and research opportunities using GIS are available through a variety of internship opportunities that will increase students' skills and employment opportunities.

## Scholarships

- **COSET GRADUATE RECRUITMENT SCHOLARSHIP.** The College of Science and Engineering Technology (COSET) Graduate Recruitment Scholarship is a \$1000 competitive scholarship awarded to outstanding students entering their first semester of a COSET master's program at SHSU and who have not been awarded a graduate assistantship. More information can be found on the College of Science and Engineering Technology website (<https://www.shsu.edu/academics/science-and-engineering-technology/>).
- **AMATO BROTHERS SCHOLARSHIP.** \$3,000 per year; Recipient must be a full-time undergraduate or graduate student, majoring in any discipline, demonstrate financial need, and exhibit commitment to continue and complete their education. The recipient must maintain a 2.5 GPA or higher in major and overall.

- **COSET GRADUATE ACHIEVEMENT SCHOLARSHIP:** The College of Science and Engineering Technology (COSET) Graduate Achievement Scholarship is a \$1000 competitive scholarship awarded to students demonstrating outstanding academic progress in a COSET master's program. More information can be found on the College of Science and Engineering Technology website (<https://www.shsu.edu/academics/science-and-engineering-technology/>).
- **THE GRADUATE STUDIES SCHOLARSHIP:** The Graduate Studies Scholarship is intended for high-quality students in SHSU graduate programs. Nominations will be accepted for both new and current students. Application Open: Scholarship Application Form (<http://www.shsu.edu/dept/graduate-studies/forms/The%20Graduate%20School%20General%20Scholarship%20Application%20Form.pdf>) (Updated 9/13/18)
- **JAMES ELLISON KIRKLEY AWARD:** Two awards (amounts vary) to majors in history, political science, geography, or sociology. Recipients are selected on basis of high academic achievement.
- For more scholarship opportunities please visit, Paying For School. (<https://www.shsu.edu/dept/graduate-studies/paying-for-school.html>)

## Geography

### **GEOG 5075. Selected Problems in Geography. 1-3 Hours.**

This course is designed for individual students who wish intensive supervision in their research or study of special topics in the field of Geography. Variable Credit (1-3).. Course Equivalents: GEOG 5375 .

### **GEOG 5310. GIS Project Management. 3 Hours.**

Management strategies for GIS are examined by presenting GIS as an integrated system of people, computer hardware, software, applications, and data. The course may include design of implementation plans as case studies to explore various techniques associated with each step of this process.

**Prerequisite:** GEOG 5361, GEOG 5362.

### **GEOG 5311. GIS in Law Enforcement. 3 Hours.**

The primary foci of this course are the application of geospatial technologies in law enforcement and national security. Course topics may include the characteristics of geospatial intelligence and crime incident data, the use of GPS imagery, and the application of other geospatial technologies. Students use methods of spatial analysis to study a variety of public safety phenomena, such as heat mapping, change detection, and geographic profiling.

### **GEOG 5312. GIS ModelBuilder. 3 Hours.**

Students focus on theories, topics, and concepts that provide students with a strong understanding of ModelBuilder, a program designed to create automated routines and workflows within a GIS environment. Through the development of skills and techniques with ModelBuilder, students learn how to create, use, and share interactive models within the ArcGIS platform. They also learn how to document models so others can use them for their own intended purposes.

**Prerequisite:** GEOG 5362.

### **GEOG 5313. Ethics in GIS. 3 Hours.**

Students learn and examine the ethical guidelines for professionals who use GIS and geospatial technologies. Topics include the ethical issues that arise during data collection, data use, and data display, as well as the obligations of GIS professionals to society, employers, colleagues, and the profession.

### **GEOG 5314. GIS for Professionals. 3 Hours.**

Students solve problems by visualizing, querying, creating, editing, analyzing, and presenting geospatial data in both 2D and 3D environments using ArcGIS mapping applications and/or similar applications.

### **GEOG 5315. Spatial Database. 3 Hours.**

Students examine and apply the theoretical and practical aspects of a spatial database. Specifically, students create, use, edit, and manage spatial and attribute data in a spatial database and define domains, subtypes, and relationship classes. The focus is on the successful design, implementation, and management of a spatial database.

### **GEOG 5361. Geographic Information. 3 Hours.**

Students examine how geospatial data are obtained, created, edited, and utilized. This includes examination of the availability and accuracy of geospatial data, geospatial portals, and the digitizing and scanning of geographic data. The creation and structure of attribute databases, and relational and object-oriented data structures also are discussed.

### **GEOG 5362. GIS Principles and Application. 3 Hours.**

Students address the basic principles of geographic information systems and their application. Structure and functionality of raster and vector based GIS, history of GIS development and evolution, management of attribute data, creation of geospatial data, and applications in numerous fields are covered as well as new developments in the field.

### **GEOG 5363. Web GIS. 3 Hours.**

Students are introduced to the principles and practices of interactive mapping and GIS data distribution across the Internet. Students learn to develop, customize, and publish GIS applications and geoprocessing tasks and share information through web services using ArcGIS Server and ArcGIS Online.

**GEOG 5364. Spatial Analysis. 3 Hours.**

Students are introduced to the fundamental knowledge and techniques of spatial analysis. Students learn how to effectively use various spatial data to solve real-world problems. Topics covered may include spatial data structure, multiple layer operations, point pattern analysis, and network analysis. Prerequisite GEOG 5361.

**GEOG 5365. Digital Image Processing. 3 Hours.**

Students develop theoretical understanding and technical proficiency in remote sensing image analysis. Students perform image processing functions and are exposed to all critical phases of project implementation expected of an image analyst. Extensive lab exercises are required.

**Prerequisite:** GEOG 5361.

**GEOG 5366. Cartography And Visualization. 3 Hours.**

Students develop theoretical understanding and technical proficiency in the art, science, and techniques used in modern automated cartography and visualization. Emphasis is placed on different mapping techniques and surface rendering. Extensive computer lab exercises are required.

**Prerequisite:** GEOG 5361.

**GEOG 5367. GIS Programming. 3 Hours.**

Students learn to use Python programming to develop customized GIS applications. Students become familiar with the fundamental concepts in object-oriented programming and develop programming skills.

**Prerequisite:** GEOG 5361.

**GEOG 5368. Geographic Information Systems Program Use and Applications. 3 Hours.**

This is an Internet-based course that requires the successful completion (as indicated by printed certificates) of ten related courses pertaining to GIS program use and applications. The course is taken through the Environmental Systems Research Institute's (ESRI) on-line virtual campus.

**Prerequisite:** GEOG 5361, GEOG 5362, GEOG 5364.

**GEOG 5369. Internship in GIS. 3 Hours.**

Students work for either a business or government agency to obtain applied experience in the use of GIS. Students must be supervised by a member of the graduate faculty, who determine whether the nature and amount of the work performed satisfies the requirements for graduate credit. In addition, students must be evaluated by their employer, and this information must be submitted to the Department Chair to be used in assignment of a grade for the course. Students are encouraged to maintain a journal and to present a paper recounting their internship experiences.

**Prerequisite:** GEOG 5361, GEOG 5362.

**GEOG 5371. Geographic Information Systems in Energy-Related Fields. 3 Hours.**

Students focus on the use and application of GIS and related geospatial technologies within a variety of energy related fields. Technological applications within pipeline routing, reservoir mapping, evaluation and visualization, and environmental assessment serve as the primary foci. Geospatial aspects of oil and gas production and distribution also are explored, as will GIS mapping and the management of GIS facilities.

**GEOG 5373. Introduction to LiDAR & Radar. 3 Hours.**

Students focus on the concepts and applications of Global Positioning Systems (GPS), Light Detection and Ranging (LiDAR), and Radar systems. Topics may include accuracy assessment and appropriate use of LiDAR, Radar, and GPS data products. Students master the skills needed to use these data products in different applications such as topographic mapping, flood inundation studies, vegetation analysis, and 3D modeling. Course components may include lectures, labs, and field work.

**Prerequisite:** GEOG 5361 or instructor's consent.

**GEOG 5374. Advanced GIS Analysis. 3 Hours.**

Students learn to systematically and effectively formulate, organize, and implement an advanced GIS analysis project. Topics may include defining research problems, collecting and preparing data, designing analytical methods, and interpreting results. Students perform geostatistical analyses and will learn how to build, modify, and streamline geoprocessing models. Credit 3

**Prerequisite:** GEOG 5364.

**GEOG 6061. Graduate Seminar In GIS. 1-3 Hours.**

This is a graduate seminar featuring results of faculty research projects, research work by graduate students, and discussions by invited speakers from government and industry who are using GIS and related technologies. Course Equivalents: GEOG 6161

**Prerequisite:** GEOG 5361, GEOG 5362, GEOG 5363, GEOG 5364, GEOG 5367.

**GEOG 6099. Thesis II. 1-3 Hours.**

The student completes a thesis involving research and study of the applications of geographic information systems and related technologies. The work involved includes research on the approved thesis topic, preparation of a draft, and a final thesis. The thesis must be at minimum of thirty pages in length and must be suitable for publication in a peer reviewed journal on the topic. Students must also make a 30-minute Power Point presentation on the approved topic. Variable Credit (1-3). Course Equivalents: GEOG 6399

**Prerequisite:** GEOG 5361, GEOG 5362, GEOG 5363, GEOG 5364, GEOG 5367, or consent of graduate supervisor.

**GEOG 6398. Thesis I. 3 Hours.**

The student begins work on a thesis involving research and study of the applications of geographic information systems and related technologies.

**Prerequisite:** GEOG 5361, GEOG 5362, GEOG 5363, GEOG 5364, GEOG 5367.

## Geology

### **GEOL 5095. Special Graduate Topics in Geology. 1-3 Hours.**

Students engage in an individual study in special areas of geology. Topic content to be selected and agreed upon by the students and member of the geology faculty. Variable Credit (1-3). Course Equivalents: GEOL 5395 .

Director/Chair: **Joseph C Hill**

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