**Department of Geosciences**

**Faculty**

**Professors**: Carlos L. V. Aiken, David E. Dunn (emeritus), John F. Ferguson, John W. Geissman, William I. Manton, George A. McMechan, Richard M. Mitterer (emeritus), John S. Oldow, Emile A. Pessagno, Jr. (emeritus), Dean C. Presnall (emeritus), Robert H. Rutford (emeritus), Robert J. Stern
**Associate Professors**: Alexander Braun, Thomas H. Brikowski, James L. Carter (emeritus), Georgia Fotopoulos
**Senior Lecturers:** William R. Griffin, Ingnacio Pujana

**Objectives**

The basic objective of the Department of Geosciences Graduate Program is to provide students with a broad fundamental background in geosciences as well as an in-depth emphasis in a particular specialty.

The Master of Science degree (thesis option) is designed for students desiring research experience in a specific area of the geosciences. This degree will prepare the student for professional employment in the energy, mining, or environmental industries or government, as well as those seeking a doctoral degree. The Master of Science degrees (non-thesis options) are designed for students who seek employment in the energy, mining, or environmental industries, and the industrial application of Geospatial Information Sciences (GIS).

The Doctor of Philosophy degree in Geosciences emphasizes basic research in one of the specialties in geosciences and is designed to prepare students for advanced positions in the energy, environmental or mining professions in industry or government, or for positions in academia.

The Doctor of Philosophy degree in Geospatial Information Sciences (GIS) is supported by the Department of Geosciences, the School of Economic, Political and Policy Sciences, and the School of Engineering and Computer Science.  The degree reflects geospatial information science origins at the confluence of work in multiple disciplines.  The degree focuses on advancement of the technology, its associated theory, and the enhancement of its applications.  Graduates of this program will be well suited to advanced positions in the geospatial technology industry and academic positions.

**Facilities**

Departmental research facilities include: digital imaging petrographic microscope, rock preparation and mineral separation facilities, electronics shop and machine shop. Separate research facilities for computing, hydrology, thermal ionization mass spectrometry, and geophysics are described below.

**Computing Facilities**

The Geosciences Department has a large number of networked Windows/PC and unix/linux workstations in several laboratories accessible to the students and faculty.  A number of laser printers are available, including a color printer. A large format HP 2500CP printer/plotter is available for creating maps and posters.  A variety of software licenses are supported for GIS, remote sensing, image processing, geophysical data processing, graphics and visualization.  Large scale computing is supported by two state of the art linux clusters, one with 10 and one with 32 64-bit processors, and 13 terabytes of disk.  A GeoWall visualization facility permits immersive interaction with 3-D data and is supported by high-resolution 3D HDTV visualization systems.

**Hydrology Laboratory**

Field equipment for measuring ground and surface water flow and chemistry, including borehole bailers, electric water level meter, FlowProbe hand-held flow meter, Hach DREL 2010 Basic Water Quality Lab (field spectrophotometer, pH and salinity meters), and YSI-85 DO/salinity/conductivity meter. Software for modeling water flow and transport, including general interfaces GMS andWMS, Hydrus-2D (unsaturated flow and transport), TOUGH2 and Tetrad (2-3D multiphase flow and transport), and many public-domain models. Hardware and software for visualizing model results, including Windows and linux workstations.

**Geochemical Laboratories**

A Perkin-Elmer 6100 DRC ICP-MS is used for determining concentrations of a wide range of elements in materials. A Finnigan MAT 261 equipped with 9 collectors and a secondary electron multiplier is supported by Class 100 clean room facilities with sub-boiling acid distillation apparatus, micro- and semi-microbalances, and vessels for pressure decomposition of refractory silicates. Studies focus on using the evolution of Sr, Nd and Pb as indexes of petrogenetic processes, geochronology, environmental Pb, and evolution of marine Sr.

**Geophysics Facilities**

Geophysical research is supported by two Scintrex CG-5 gravimeters and a Micro-g A-10 absolute gravimeter; a variety of surveying instruments including a Nikon theodolite and data collector, a TOPCON GPT 3005LW total station electronic distance meter and theodolite, two Laser Atlanta Advantage CI reflectorless laser rangefinders,  a Riegl LMP 3800 laser scanner and a Riegl LSM Z620 laser scanner, seven dual frequency Leica Viva RTK GPS systems, three dual frequency Topcon HyperLite RTK GPS systems (6 receivers), nine dual frequency Leica SR9500 GPS receiver systems with choke-ring antennas, a Trimble GeoXT GPS system, a Trimble GeoHT GPS system and GPS post-processing software including Leica SKI, Trimble Pathfinder Office and BERNESE.  A Geometrics proton-procession total field magnetometer system, An AGI SuperSting R1/IP DC resistivity and induced polarization system is available for near surface electrical conductivity mapping.  Seismic and radar equipment include a Geometrics 48-channel floating point seismic acquisition system with Betsy, hammer, and explosive sources for shallow to deep exploration; and pulse EKKO IV and 1000 ground penetrating radars.

**Admission Requirements**

The University’s general admission requirements are discussed [here](http://www.utdallas.edu/dept/graddean/CAT2010/FIRST40/admissions.htm).

Applicants are expected to take the GRE General Test (Verbal, Quantitative, and Analytical Writing). A combined score of no less than 1000 on the Verbal and Quantitative portions of the exam is advisable based on our experience with student success in the program. In addition, students should complete and submit a Supplemental Geosciences Application Form which can be obtained from the Geosciences Department Office by mail (FO21, University of Texas at Dallas, 800 W Campbell Rd, Richardson, TX, 75080, USA), telephone (972-883-2401), or e-mail (geosci@utdallas.edu).

Entering students are expected to have completed the equivalent of the University’s B.S. degree in Geosciences, as well as a 3-hour scientific programming course. Students whose undergraduate training is in a science other than geology or geophysics are admitted to the program when their previous course work complements or supports their intended research interests. Students may be admitted with some deficiencies but these must be completed during the first 18 graduate hours. It is understood that the minimum course requirements for the intended degree, as specified below, apply to well-prepared students.

**Degree Requirements**

The University’s general degree requirements are discussed [here](http://www.utdallas.edu/dept/graddean/CAT2010/FIRST40/degree_prg_policies.htm).

Additional requirements are specified below for each degree.

**Graduate Certificate in Remote Sensing**

The Remote Sensing Certificate is supported by the Department of Geosciences and the School of Economic, Political and Policy Sciences.

The American Society for Photogrammetry and Remote Sensing (1997) defined remote sensing as the art, science, and technology of obtaining reliable information about physical objects and the environment, through the process of recording, measuring and interpreting imagery and digital representation of energy patterns derived from non-contact sensor systems.

Remote sensing is a powerful set of software and hardware, computer-based techniques for extraction and presentation of information represented by raster and vector spatial data acquired via non-contact sensors. It provides reliable and cost-effective means of studying the environment for protection, natural resources management and urban planning. Government and non-government organizations continuously seek qualified professionals to use remote sensing for a wide range of applications.

**Pre-requisites and Admission**

         B.S. or B.A. Degree. Competence in personal computers, especially Windows-based, is expected.

         Application for admission to UTD Graduate School as "non-degree or degree seeking"

         Only B.S. or B.A. transcripts are needed. No GRE score or reference letters are needed for non-degree seeking students.

         On-line registration is at: [www.utdallas.edu/admissions](http://www.utdallas.edu/admissions)

**Course Requirements**

The Graduate Certificate in Remote Sensing is obtained by completing 15 hours of courses. Students must complete the following courses: GEOS 5325 Introduction to Remote Sensing, GISC 6381 Introduction to GIS, GEOS 5326 or GISC 7365 Remote Sensing Digital Image Processing, GISC 7366 Applied Remote Sensing and GEOS 7327 or GISC 7367 Remote Sensing Workshop.

**Master of Science in Geosciences**

**Thesis Option**

All students seeking the Master of Science degree (thesis option) must satisfactorily complete the following requirements (a minimum of 36 graduate semester hours):

* GEOS 5307, GEOS 5327, GEOS 5375, and GEOS 5387
* A minimum of 15 hours of additional graduate courses.
* A minimum of nine semester hours of thesis research including GEOS 8398 and submit an acceptable thesis.

In addition to the above requirements, students seeking the M.S. degree (thesis option) must submit, no later than the second semester of enrollment, an acceptable degree plan and a research proposal to their supervising committee. Upon completion of the thesis research, the M.S. degree candidate will publicly defend the thesis.

**Non-Thesis Option**

All students seeking the Master of Science degree (non-thesis option) must satisfactorily complete a minimum of 36 graduate semester hours including the specified Geosciences courses below.

* GEOS 5307, GEOS 5327, GEOS 5375, and GEOS 5387
* A minimum of 21 hours of additional graduate courses, to be selected in consultation with the graduate advisor.
* Research: An 8000 level, 3-hour research course.

In addition to the above requirements, students seeking the M.S. degree (non-thesis option) must submit, no later than the second semester of enrollment, an acceptable degree plan.

**Master of Science in Geographic Information Sciences**

The Master of Science in Geographic Information Sciences is a professional program that is offered jointly by the School of Economic, Political and Policy Sciences and the School of Natural Sciences and Mathematics. The program focuses on the use of Geographic Information Systems (GIS) and associated technologies such as remote sensing and global positioning systems for managing spatially referenced information. Students are provided with the concepts underlying GIS, the skills for implementing GIS projects in public and private sector organizations, and the ability to use GIS in pure or applied research in substantive areas. Prospective students should apply using established procedures to either Geosciences or the School of Economic, Political and Policy Sciences depending on their background.

For the Master’s degree in Geographic Information Sciences, beginning students are expected to have completed college Mathematics through Calculus and at least one programming or computer applications course or possess equivalent knowledge. Students must have the equivalent of GISC 6381 Geographic Information Systems Fundamentals and GISC 6382 Applied GIS, or they must take these courses at UTD in addition to the 30 credit hours required for the MGIS.  Additional details of the curriculum can be found under "Master of Science in Geographic Information Sciences," in the School of Social Sciences section of the catalog.

**Doctor of Philosophy in Geosciences**

All students seeking a Doctor of Philosophy degree in Geosciences must satisfactorily complete the following requirements (75 graduate hours minimum).

* GEOS 5307, GEOS 5327, GEOS 5375, and GEOS 5387
* A minimum of 18 hours of additional Geosciences graduate courses to be specified by the student's research supervisory committee and the Graduate Advisor.
* A minimum of 36 hours of additional graduate courses or research.
* A minimum of nine semester hours of thesis research including GEOS 8399 and submit an acceptable dissertation.

In addition to the above course requirements, students seeking the Ph.D. degree must submit an acceptable degree plan and research proposal describing the intended project to be completed for the dissertation. Students entering with a Master’s should complete this proposal in the third semester; students entering without a Master’s have until the fourth semester. An oral qualifying examination covering the broad background and detailed knowledge relating to the student’s specialization and research proposal will be held in the same semester that the proposal is submitted. After satisfactory performance on the Qualifying Examination, the student will complete and publicly defend the dissertation.

Also, see the University’s [general degree requirements](http://www.utdallas.edu/dept/graddean/CAT2010/FIRST40/degree_prg_policies.htm). Please note that more detailed instructions for Geosciences Graduate students are given in the "Guideline for Graduate Students - Geosciences" that is available in the office of the Department Head.

**Doctor of Philosophy in Geospatial Information Sciences**

The Doctor of Philosophy in Geospatial Information Sciences is an advanced degree offered jointly by the School of Natural Sciences and Mathematics, the School of Economic, Political and Policy Sciences and the Eric Jonsson School of Engineering and Computer Science. Geospatial information is a unifying theme across a wide range of disciplines and the unique organization of this program permits a diverse range of expertise to the prospective student. The Ph.D. in GIS is intended to go beyond the M.S. in GIS degree in terms of analysis, the creation of new technology and the novel application of geospatial information technology. This program will prepare students for leadership positions in academy, industry or government.

Individual students can concentrate in particular discipline areas. The Geosciences component focuses on remote sensing and mapping technologies, including global positioning satellite and three-dimensional laser ranging based data capture as well as other imaging technologies. In particular, these methodologies are applied to geological, hydrological and environmental problems associated with the physical Earth.

It is expected that students will enter this program with diverse educational backgrounds. Applicants may have Bachelors, Masters or other advanced degrees in any relevant field including computer science, economics, engineering, geography, geology, information system management, resource management, geographical information science and possibly others. At least a Bachelors degree from an accredited (or equivalent) institution with an undergraduate/graduate grade point average of 3.25 or better is required. A GRE score of 1150 or higher is desirable. Fluency in written and spoken English is required.  (Please see detailed degree requirements under "Doctor of Philosophy in Geospatial Information Sciences," listed in the School of Social Sciences section of the catalog.)