Geology, M.S.

COLLEGE OF SCIENCE AND TECHNOLOGY (http://cst.temple.edu)

About the Program

The Department of Earth and Environmental Science offers a two-year M.S. program that includes graduate courses in Geology, weekly graduate seminars, qualifying exams, and research leading to a master's thesis.

Time Limit for Degree Completion: 3 years

Campus Location: Main

Full-Time/Part-Time Status: Full-time status is expected.

Areas of Specialization: Advanced courses and research opportunities are available in cyclic stratigraphy, environmental geology, geochemistry, geophysics, hydrogeology, mineral science, paleopedology and modern soils, petrology, and sedimentology.

Job Prospects: Graduates secure positions in industry and government and are accepted into doctoral programs.

Licensure: Licensure is recommended after three years of on-the-job training. The Pennsylvania Professional Geologist Licensing Examination is administered by the National Association of State Boards of Geology (ASBOG).

Non-Matriculated Student Policy: Non-matriculated students are allowed to take up to 9 credits before applying to the program.

Financing Opportunities: Teaching Assistants teach introductory geology labs and attend weekly seminars. Graduate students in our program are usually given a Teaching Assistantship, which carries a stipend and full-tuition remission (up to 12 credits per term).

Admission Requirements and Deadlines

Application Deadline:

Fall: February 1
Spring: October 1

Applications are evaluated together after the deadline has passed. Program admissions are limited and competitive.

APPLY ONLINE to this graduate program.

Letters of Reference:

Number Required: 2

From Whom: Letters of recommendation should be obtained from college/university faculty members familiar with the applicant's academic competence.

Coursework Required for Admission Consideration: Applicants are required to have taken at least five courses in Geology and one year of college-level Chemistry, Calculus, and Physics or Biology.

Bachelor's Degree in Discipline/Related Discipline: A baccalaureate degree, whether a B.A. or a B.S., with a major in Geology or a related program in Science or Mathematics is required.

Statement of Goals: Includes your specific interest in Temple's program; your research goals; your future career goals; and your academic and research achievements.

Standardized Test Scores:

GRE: Required. Scores are typically in the 50th percentile or higher in the quantitative, verbal, and analytical areas.

TOEFL: 105 iBT or 620 PBT minimum

Program Requirements

General Program Requirements:

Number of Didactic Credits Required Beyond the Baccalaureate: 24

Required Courses:

Select seven of the following:

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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>EES 5402</td>
<td>X-ray Crystallography</td>
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Culminating Events:

Comprehensive Examination:
The purpose of the comprehensive examination is to demonstrate breadth and depth of knowledge in the concepts of geological sciences. The exam has written and oral sections. The subject areas are general geology in the written portion and discussion of a potential thesis topic and other general geology concepts in the oral portion. The examination is taken when the student completes approximately 20 credits. Comprehensive examinations are generally administered once annually in April. The written examination runs from 9 a.m. to 3 p.m. The oral examination runs about 1 hour.

The Graduate Faculty in the Geology program write the questions. Faculty members from each area of specialization participate. The Graduate Faculty members who write the questions also evaluate the answers. The written examination is evaluated for content and understanding of core concepts. The oral examination is evaluated on the basis of clarity of the thesis proposal presentation and other general geology concepts. The oral examination is evaluated by the student’s advisor and at least two other faculty members. The combined results of the written and oral examinations determine whether a student has qualified.

Thesis:
The Department of Earth and Environmental Science requires an original research thesis as the culminating project for its master's degree program. The purpose is to involve each degree candidate in a field or laboratory research project in which the student gains experience in designing a project, specifying hypotheses to be tested, carrying out sampling procedures, and determining analyses results. The project is then presented in written form (typically 75-150 pages) with title page, abstract, introduction, methods, data, interpretation, tables, figures, plates, and references. Students are required to defend their theses publicly to the academic community. The defense is scheduled two weeks after the student's advisor and committee have approved the thesis document. The thesis is evaluated by a committee of two faculty members and the thesis advisor. The thesis is evaluated for both scientific content and writing style.

Contacts

Program Web Address:
http://cst.temple.edu/academics/graduate-programs/earth-environmental-science

Department Information:
Dept. of Earth and Environmental Science
326 Beury Hall
1901 N. 13th Street
Philadelphia, PA 19122-6081
scox@temple.edu
215-204-8227

Mailing Address for Application Materials:
Dept. of Earth and Environmental Science
303 Beury Hall (016-00)
1901 N. 13th Street
Philadelphia, PA 19122-6081
Department Contacts:

Admissions:
Shelah Cox
scocox@temple.edu
215-204-8227

Graduate Advisor:
Dennis O. Terry, Ph.D.
doterry@temple.edu
215-204-8226

Chairperson:
Jonathan E. Nyquist, Ph.D.
nyq@temple.edu
215-204-7484

Courses

EES 5011. Remote Sensing and GIS. 4 Credit Hours.
The focus of this class is on remote sensing technologies and geographic information systems. Remote sensing is a dynamic field; new, high-resolution satellites are coming on line almost daily, and there has been an exponential growth in applications of remote sensing data during the past decade, including: mineral exploration, precision agriculture, watershed management, land use classification, military intelligence, and climate monitoring. By the end of the semester you will have a fundamental understanding of the uses and limitations of remote sensing data for environmental applications, and a thorough familiarity with geographic information systems.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate
Repeatability: This course may not be repeated for additional credits.

EES 5042. Coastal Processes. 4 Credit Hours.
The course will apply a process geomorphological approach to understanding coastal behavior, including global distribution of coasts, wave and tidal hydrodynamics, nearshore and aeolian sediment transport, and morphological signatures of extreme events.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate
Repeatability: This course may not be repeated for additional credits.

EES 5101. Structural Geology (Graduate). 4 Credit Hours.
The purpose of this course is to train students in the concepts and techniques of structural geology. Students will learn how to collect, analyze, and interpret geologic data drawn from a variety of disciplines pertinent to structural geology and present a cohesive analysis and interpretation of these results. Results are presented as maps, reports, and computer models. A hypothesis driven term project will be conducted by the graduate student on a topic in structural geology. NOTE: This course differs from the undergraduate version EES 4101 through graduate specific laboratory and exam questions, readings, and the term project.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate
Repeatability: This course may not be repeated for additional credits.

EES 5402. X-ray Crystallography. 4 Credit Hours.
Generation and use of x-rays for diffraction analysis; Analysis of clays and related minerals by x-ray diffraction; Crystal structure patterns and biogeofunctional groups.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate
Repeatability: This course may not be repeated for additional credits.

EES 5406. Environmental Nanogeoscience. 4 Credit Hours.
Nanotechnology has developed rapidly in the past decade, yet our knowledge of its environmental impact, particularly regarding the fate and behavior of nanomaterials in the environment, lags far behind. This course will cover a range of topics concerning nanomaterials in the environment, ranging from the unique size-dependent properties of nanomaterials to their applications in environmental remediation. The lab component of this course will include nanomaterial synthesis and characterization; nanomaterial transport, aggregation, deposition, transformation, and persistence in natural settings; environmental applications of nanomaterials; and nanomaterial characterization techniques, particularly electron microscopy.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate
Repeatability: This course may not be repeated for additional credits.

EES 5454. Introduction to Geophysics. 4 Credit Hours.
An introduction to gravity, magnetic, electromagnetic, and seismic exploration methods. Applications include environmental characterization, oil and mineral exploration, geotechnical engineering, and archeology.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate
Repeatability: This course may not be repeated for additional credits.
EES 5461. Low-Temperature Geochemistry. 4 Credit Hours.
Principles of aqueous geochemistry discussed within the framework of geologic processes. One or two field trips.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate
Repeatability: This course may not be repeated for additional credits.

EES 5462. Advanced Low-Temperature Geochemistry. 3 Credit Hours.
Study and discussion of topics in aqueous and sedimentary geochemistry.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate
Repeatability: This course may not be repeated for additional credits.

EES 5501. Vertebrate Paleontology and Taphonomy. 3 Credit Hours.
This course examines vertebrate fossils and their importance for interpreting and reconstructing terrestrial ecosystems. Students will learn the basics of vertebrate skeletal anatomy, interpret transport and depositional histories of skeletal elements and assemblages, and combine this information with geologic data to reconstruct paleoenvironmental settings and paleocommunity associations. Several class sessions will meet off-campus at local museums; one weekend field trip is required.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate
Repeatability: This course may not be repeated for additional credits.

EES 5525. Electron Optical Techniques. 4 Credit Hours.
This course will introduce the microanalytical and imaging methods of electron optical instruments such as the Electron Probe Microanalyzer (EPMA) and the Scanning Electron Microscope (SEM). The theory and operation of the instruments will be covered as will the interpretation of images and analytical results.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate
Repeatability: This course may not be repeated for additional credits.

EES 5701. Quantitative Structural Geo. 4 Credit Hours.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate
Repeatability: This course may not be repeated for additional credits.

EES 5725. Soils and Paleosols. 4 Credit Hours.
The course is divided into two parts: modern soils and paleosols. The goals of this course are to teach students the fundamentals of modern soil genesis and classification in order to interpret ancient soils preserved in the rock record (paleosols), and to incorporate models of soil genesis into the traditional geology paradigm. Students will be exposed to a combination of laboratory methods and field work.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate
Repeatability: This course may not be repeated for additional credits.

EES 8000. Geology Seminar. 1 Credit Hour.
Required of M.A. students. Visiting specialists in a wide variety of geologic fields will lecture and discuss their research.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate
Repeatability: This course may be repeated for additional credit.

EES 8082. Independent Study Program. 1 to 3 Credit Hour.
Limited to Geology graduate students with permission from the department.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate
Repeatability: This course may be repeated for additional credit.
EES 8200. Graduate Geology Seminar. 3 to 6 Credit Hours.
Advanced seminar course; subject matter varies from semester to semester. The educational objectives of the course are to focus on current issues at the interfaces of geological processes through advanced technological methods of analysis.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate

**Repeatability:** This course may be repeated for additional credit.

EES 8411. Advanced Hydrogeology. 4 Credit Hours.
This course covers water resources with an emphasis on groundwater. Topics include quantifying groundwater flow, groundwater-surface water interactions, contaminant transport, and a brief introduction to modeling. Problem sets and labs are used to develop specific skills, including field techniques.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate

**Repeatability:** This course may not be repeated for additional credits.

EES 8421. Groundwater Modeling. 3 Credit Hours.
This course offers students a chance to construct models using well known codes such as MODFLOW and other practical tools. The goals of this course are: learn tools for groundwater flow modeling, be able to recognize how to judge models and compare them with reality, and gain computer skills that can be used with a wide variety tools.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate

**Repeatability:** This course may not be repeated for additional credits.

EES 8434. Ecohydrology. 4 Credit Hours.
Hydrological and ecological processes are tightly interrelated, with vegetation affecting the hydrological cycle, and hydrologic partitioning of the water budget affecting vegetation dynamics. This course builds on perspectives from ecology, hydrology, and soil science to focus on the emerging, interdisciplinary area of ecohydrology – the science that studies mutual interaction between the hydrological cycle and ecosystems. The first part of the course will deal with fundamental processes controlling the flow of water in the biosphere (in land, atmosphere, soil and plants) and the interactions with ecological processes and human dimensions at different scales. The second part will deal with the implications of ecohydrological feedbacks, covering broad range of issues including global environmental change, land use change, global desertification/land degradation, urbanization, soil erosion, and the food-energy-water nexus. The laboratory sections will provide an opportunity to familiarize with the ecohydrological field techniques and offer a forum for critical review of current scientific literature. The concepts and principles discussed in the class will have broad applications ranging from – finding innovative solutions to ecosystem degradation and food security, and designing global change responses.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate

**Repeatability:** This course may not be repeated for additional credits.

EES 8701. High Temperature Reactions. 4 Credit Hours.
Thermodynamic laws and theory are used to discuss igneous and metamorphic processes. Exact field relationships are combined with thermodynamics to solve applied petrologic problems.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate

**Repeatability:** This course may not be repeated for additional credits.

EES 8706. Regional Geology. 3 Credit Hours.
Discussion of the geologic history and tectonics of selected regions.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate

**Repeatability:** This course may not be repeated for additional credits.

EES 8711. Economics of Geo Ore Deposits. 3 Credit Hours.
Study of the geology, origin, distribution, economics and extraction methods of major classes of ore deposits.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate

**Repeatability:** This course may not be repeated for additional credits.

EES 8911. Teaching of Geology. 0 to 1 Credit Hours.
Required of all teaching assistants in their first semester of teaching. Instruction and evaluation of teaching laboratory, or discussion sections.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate

**Repeatability:** This course may be repeated for additional credit.

EES 9996. Master's Research and Thesis. 1 to 6 Credit Hour.
The research topic and plan must be approved by the graduate advisor and the instructor who is to supervise the thesis, at least two months before the research is to begin.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate

**Repeatability:** This course may be repeated for additional credit.