

SUBSURFACE GEOSCIENCE

THE WIESS SCHOOL OF NATURAL SCIENCES

DIRECTORS

Alan Levander
Dale S. Sawyer

PROFESSORS

John B. Anderson
Andrew R. Barron
André W. Droxler
Katherine B. Ensor

ASSOCIATE PROFESSORS

Gerald R. Dickens
Julia Morgan
Colin A. Zelt

ASSISTANT PROFESSORS

Brandon Dugan
Fenglin Niu

ADJUNCT PROFESSOR

Steve H. Danbom

LECTURER

W. C. Rusty Riese

DEGREES OFFERED: MS

Rice University introduced the professional master's degree in subsurface geoscience in fall 2003. This degree is designed for students who wish to become proficient in applying geological knowledge and geophysical methods to finding and developing reserves of oil and natural gas. Students can specialize in one of three focus areas: information technology, geology, and geophysics. The information technology focus area prepares students to apply IT principles to the rapidly growing industry need to store, access, and interpret very large and diverse geological, geophysical, cultural, and infrastructural datasets. The geology focus area prepares students to be explorationists, with strong skills in using seismic and other geophysical methods along with geological principles to find oil and natural gas. The geophysics focus area prepares students to become technical experts in aspects of exploration seismology.

The subsurface geoscience degree is 1 of 3 tracks in the Professional Master's Program at Rice housed in the Wiess School of Natural Sciences. These master's degrees are designed for students seeking to gain further scientific core expertise coupled with enhanced management and communication skills. These degrees instill a level of scholastic proficiency that exceeds that of the bachelor's level, and they create the cross-functional aptitudes needed in modern industry. This program will allow students to move more easily into management careers in consulting or research and development, design, and/or marketing within oil-and gas-related industries.

DEGREE REQUIREMENTS FOR MS IN SUBSURFACE GEOSCIENCE

In addition to core science courses, students are required to complete a 3- to 6-month internship and take a set of cohort courses focusing on business and communication. Students select a group of elective courses from 1 of 3 focus areas: geology, geophysics, or information geology. Students must present their internship project in both oral and written form in the Professional Master's Seminar.

Part-time students who already work in their area of study may fulfill the internship requirement by working on an approved project with their current employer. For general university requirements for graduate study, see pages 56–58, and see also Professional Degrees, page 58.

ADMISSION

Admission to graduate study in subsurface geoscience is open to qualified students holding a bachelor's degree in science that includes course work in general chemistry, physics, calculus, differential equations, and linear algebra. Department faculty evaluate the previous academic record and credentials of each applicant individually.

Science core courses:

ESCI 415 *Petroleum Geology* (S)
 ESCI 417 *Petroleum Industry Economics and Management* (S)
 ESCI 420 *Modern Industrial Exploration Techniques* (S)
 ESCI 440 *Geophysical Data Analysis: Digital Signal Processing* or
 ESCI 441 *Geophysical Data Analysis: Inverse Theory*
 ESCI 441 *Geophysical Data Analysis* (F)

ESCI 442 *Exploration Geophysics I* (F)
 ESCI 444 *Exploration Geophysics II* (S)

Cohort courses:

NSCI 610 *Management in Science and Engineering* (F)
 NSCI 501 *Professional Master's Seminar* (F, S) [required for 2 semesters]
 NSCI 511 *Science Policy and Ethics* (S)
 NSCI 512 *Professional Master's Project* (F, S)

INTERNSHIP

An internship may be conducted under the guidance of a host company, government agency, or national laboratory. A summary of the internship project is required in both oral and written form as part of the Professional Master's Project.

ELECTIVE COURSES

NOTE: Each of these electives is not offered every year, and some courses may have prerequisites or require instructor permission.

Students will choose 4 electives. Recommended courses include, but are not limited to, the following:

Information Technology

COMP 429 *Introduction to Computer Networks* (S)
 ESCI 454 *Geographic Information Science* (F)
 STAT 310 *Probability and Statistics* (F, S)
 STAT 410 *Introduction to Statistical Computing and Computer Models* (F, S)

Geology Focus Area

ESCI 427 *Seismic Sequence Stratigraphy* (S)
 ESCI 428 *Interpretation of Reflection Seismograms* (F)
 ESCI 450 *Remote Sensing* (S)
 ESCI 463 *Advanced Structural Geology* (F)
 ESCI 467 *Geomechanics* (F)
 ESCI 470 *Quantitative Hydrogeology* (S)
 ESCI 504 *Siliciclastic Depositional Systems* (F)
 ESCI 505 *Applied Sedimentology* (F)
 ESCI 506 *Carbonate Depositional Systems* (S)

Geophysics Focus Area

CENG 571 *Flow and Transport through Porous Media I* (S)
 ESCI 427 *Seismic Sequence Stratigraphy* (S)
 ESCI 428 *Interpretation of Reflection Seismograms* (F)
 ESCI 454 *Geographic Information Science* (F)
 ESCI 461 *Seismology I* (F)
 ESCI 467 *Geomechanics* (F)
 ESCI 542 *Seismology II* (F)

Additional Electives

CAAM 378 *Introduction to Operations Research* (F)
 ECON 486 *Energy Economics* (S)
 CEVE 322 *Engineering Economics for Engineers* (F)
 NSCI 625 *New Venture Creation for Science and Engineering* (S)

MGMT 617 *Managerial Decision Making* (S)

MGMT 636 *Systems Analysis and
Database Design*

MGMT 661 *International Business Law* (S)

MGMT 674 *Production and Operations
Management* (F)

MGMT 676 *Project Management/Project
Finance* (S)

MGMT 721 *General Business Law* (S)

PROFESSIONAL SCIENCE MASTER'S 5TH YEAR DEGREE OPTION FOR RICE UNDERGRADUATES

Rice students have an option to achieve the MS in subsurface geoscience by adding an additional 5th year to the 4 undergraduate years of science studies. Advanced Rice students in good standing apply during their junior year, then start taking required core courses of the subsurface geoscience program during their senior year. A plan of study based on their particular focus area will need to be approved by the track director and the PSM coordinator.