

What is Earth Sciences?

Earth Scientists apply the principles of physics, chemistry, biology and mathematics to study the formation and evolution of our planet.

Minerals and rocks help Earth Scientists understand the composition and structure of the planet and how this planet has evolved over time.

Earth Science includes the study of the interactions between the Earth's processes and ecological as well as human interactions.

For example, it deals with the

- origin of mountains, continents and oceans
- exploration of minerals used for mining
- deposits of gemstones
- interpretation of fossils
- search for new resources and energy sources
- study of freshwater, incl. groundwater and ocean water systems
- contamination and pollution

Studying Earth Sciences at SU



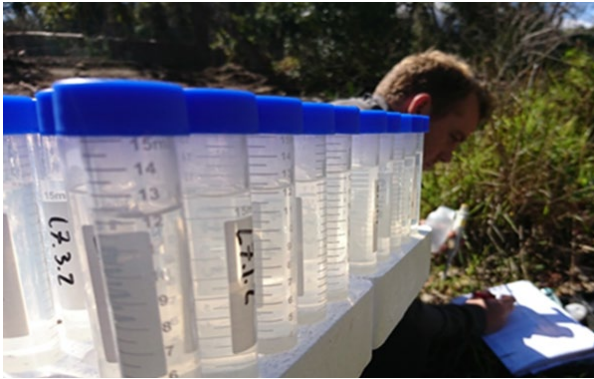
www.sun.ac.za/earthsci

What do Earth Scientists do?

One typical work area is in the mining or exploration industry in South Africa and abroad. Here, Earth Scientists use their knowledge to combine field observations with petrology, structural geology and geochemistry to understand the formation and occurrence of natural resources. This could be iron ore, platinum, diamonds and many other metals and non-metals.

Geoscientists also work in environmental consulting companies specializing on water resources and air or water quality. They can specialize in areas such as climate change, clean water supply, marine geochemistry, hazardous waste management and environmental consulting.





Career Opportunities

With a broad basis of Earth Science knowledge and skills, Earth Science graduates are typically at the front for challenging national and international careers, such as:

- Mining industries
- Exploration companies
- Environmental consultancies
- Geological consultancies
- Universities
- Municipalities and governmental institutions
- Council for Scientific and Industrial Research (CSIR)
- Council for Geosciences (CGS)



Structure of a BSc – Bachelor of Sciences - in Earth Sciences

The Department of Earth Science offers a 3-year BSc programme in Earth Sciences. The BSc programme qualifies students to undertake postgraduate studies in Earth Sciences (Honours, Masters and PhD) at this or other universities both in South Africa and overseas.

Students can select one of two streams:

- A) **Applied Earth Sciences** and B) **Geo-Environmental Sciences**.

Both streams follow the same common first year curriculum but diverge at second year, although there are still a number of modules that are common to both streams.



1st year

Common modules (both streams)

Geo-Environmental Sciences (2 courses)
 Chemistry (2 courses)
 Earth Science Field Skills

+ one of the following combinations:

a) Physics, Mathematics
 b) Physics (Bio), Mathematics (Bio), Biology
 c) Physics (Bio) and Mathematics

**for binding details on the courses applicable to the year you apply for please consult the [Faculty of Science Calender](#), page 64*

Structure of a BSc in Earth Sciences – 2nd year; specialize in your stream:

*for binding details on the courses applicable to the year you apply for please consult the [Faculty of Science Calender](#), page 64 and 66

Applied Earth Sciences Stream

Mineralogy
Environmental Geochemistry
Optical Mineralogy and Petrography
Physical Earth Sciences and Structural Geology
Earth Science Field Skills
Geographical Information Systems
Spatial Data Management (GIT)

and select one of the following modules:

Earth Observation (GIT)
Digital Photogrammetry (GIT)
Inorganic Chemistry
Chemical Analysis

Geo-Environmental Sciences Stream

Mineralogy
Environmental Geochemistry
Physical Earth Sciences and Structural Geology
Environmental Field Skills
Geographical Information Systems
Geographical Information Technology
Environmental Studies
Inorganic Chemistry
Chemical Analysis 1

Applied Earth Sciences Stream

Ingeous Petrology
Sedimentology and Stratigraphy
Economic Geology
Metamorphic Petrology and Tectonics
Science Field Skills
Spatial Analysis (GIT)

and select two of the following modules:

Hydrogeology
Soil Science
Spatial Data Acquisition (GIT)
Spatial Modelling (GIT)

Geo-Environmental Sciences Stream

Sedimentology and Stratigraphy
Economic Geology
Hydrogeology
Environmental Field Skills
Environmental Geochemistry
Geography
Environmental Studies
Spatial Analysis (GIT)
Spatial Modelling (GIT)

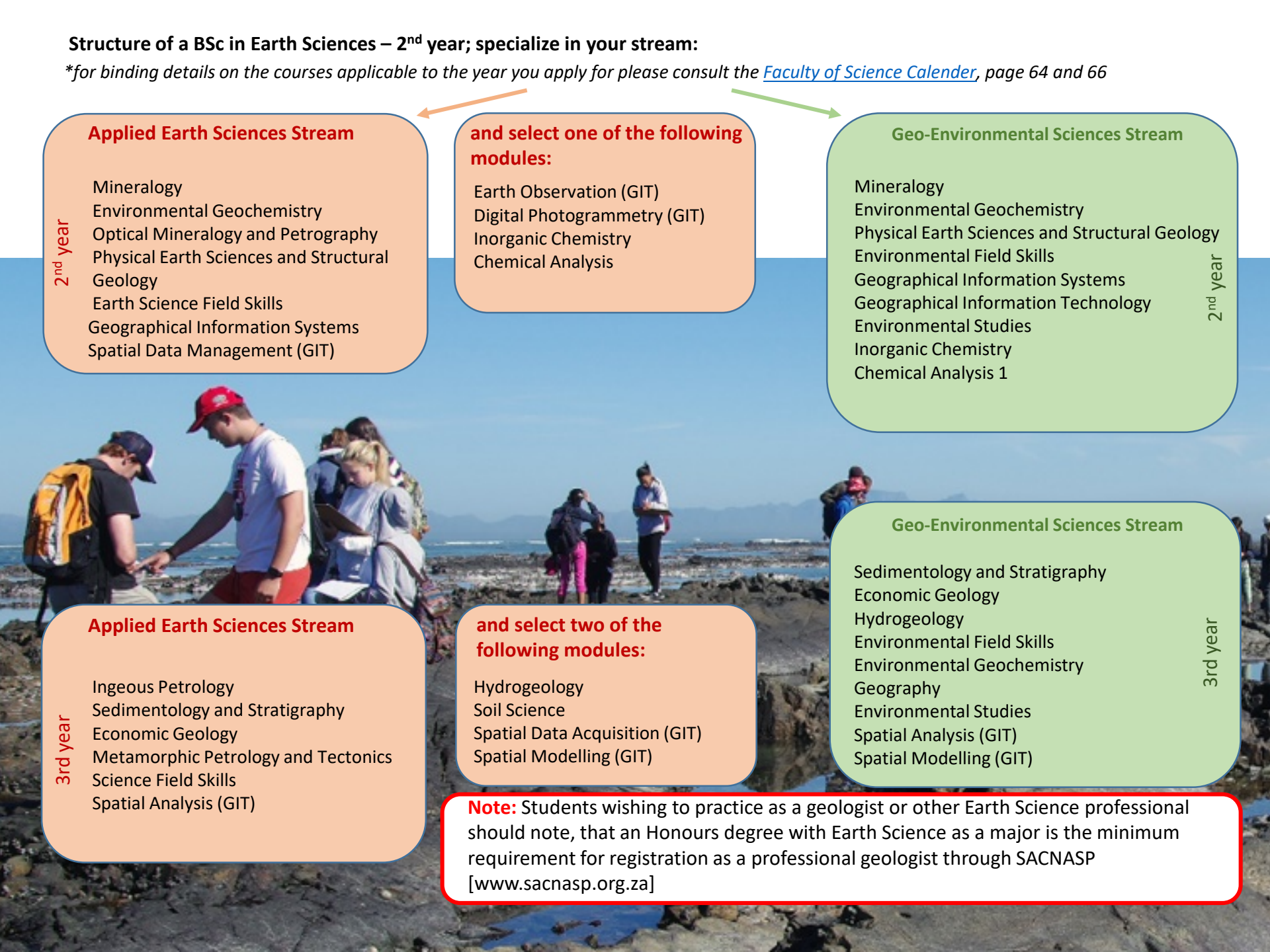
Note: Students wishing to practice as a geologist or other Earth Science professional should note, that an Honours degree with Earth Science as a major is the minimum requirement for registration as a professional geologist through SACNASP [www.sacnasp.org.za]

2nd year

2nd year

3rd year

3rd year



BSc Honours in Earth Sciences

In order to register as a professional geologist, students must undertake a 4th year of studies to complete their BSc Honours in Earth Sciences. This is a one year full time programme that involves both course work and an individual research project.

The programme has two streams: **Applied Geology** and **Environmental Geochemistry**.

A set of compulsory modules must be taken by all students. In addition, students must choose one of the streams depending on their interest.

Compulsory core modules for both streams:

Geology of Southern Africa
Research Methods in Earth Sciences
Special Topics in Earth Sciences
Research Project

Applied Geology Stream

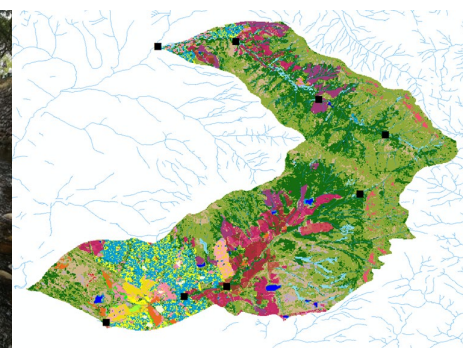
Concepts in Crustal Petrology
Economic Geology

Environmental Geochemistry Stream

Hazardous Waste Site Assessment
Environmental Systems

The research project constitutes over 25 % of the programme content and consists of about 14 weeks of independent research involving field work, analytical work, experimental work, theoretical concepts and writing of a thesis.

**for binding details on the courses applicable for the year you apply for please consult the [Faculty of Science Calender](#), page 108*



How to apply to study Earth Sciences at SU

Undergraduate: BACHELOR OF SCIENCE IN EARTH SCIENCE

- Step 1 Consult the Faculty of Science handbook and website for the latest entrance requirements:
(<http://www.sun.ac.za/english/maties/what-can-i-study/undergraduates> find Science → Physical Sciences → Earth Sciences)
- Step 2 Sit the National Benchmark Tests (NBT) including the Mathematics Component
- Step 3 Decide which stream you wish to register for
- Step 4 Apply online at www.maties.com. Here you can also find information about fees, bursaries, accommodation and student life.



Postgraduate: BSc HONOURS IN EARTH SCIENCE

- Step 1 Admittance to the Honours programme is extremely competitive. Consult the Faculty of Science handbook and website (<http://www0.sun.ac.za/pgstudies/postgraduate-programmes/faculty-of-science-1/department-of-earth-sciences.html>) for the latest entrance requirements. Although a 65% average for 3rd year earth science modules is required for admission to the Earth Sciences B.Sc. Honours programme, other factors may also be taken into account when considering students with a lower average and external applicants.
- Step 2 Contact the Honours coordinator at earthsciences@sun.ac.za
- Step 3 Apply online at <http://www.sun.ac.za/pgstudies> by the deadline stipulated on the website (usually the 1st October of the year preceding study year).
- Step 4 Current SU Earth Science students must also submit the internal application form before the deadline stipulated on the website (usually the 1st October of the year preceding study year):
<http://www.sun.ac.za/english/faculty/science/earthsciences/prospective-students/postgraduate-programme/prospective-postgraduate-students>

Postgraduate: MSc (Master of Science) and PhD (Doctor of Philosophy)

All our higher degrees (MSc and PhD) are by research, which means that you will work on a specific research topic and finalize this with a thesis and an oral defence.

Please check our application guidelines on the website www.sun.ac.za/earthsci



Some topics you will learn more about during your Earth Science Studies...

Mineralogy

Nucleation and growth of minerals in a variety of contexts and their preservation in the rock record

Isotope Hydrology

The use of stable and radioactive isotopes to trace the movement and interaction of water bodies involved in the hydrological cycle

Experimental Petrology

The use of experiments to model the behavior of minerals and rocks at different temperatures and pressures simulating different depth in the earth's crust and mantle.

Biogeochemistry

Studying the interactions of geochemical and biological processes in marine and terrestrial ecosystems.

Tectonics

The study of large scale structural processes that control the movement of crustal plates across the surface of the planet.

Geochronology

The determination of the timescale of geological history through both absolute and relative dating methods.

Metamorphic Petrology

The study of the mineralogy, textures and field relationships of metamorphic rocks and what they can tell us about their formation and evolution.

Economic Geology

The formation and characterization of ore deposits (i.e. earth's materials that are of economic or industrial interest).

Vertebrate Taphonomy

The transition of organic matter from the biosphere to the lithosphere -Earth's fossil rock record

Igneous Petrogenesis

The occurrence, field relationships, structural characterization, mineralogy and geochemistry of igneous rocks at it pertains to their formation