Bachelor of Applied Science (Geoscience) (SC01)

Year offered: 2010
Admissions: Yes
CRICOS code: 003502J
Course duration (full-time): 3 Years
Course duration (part-time): 6 Years
Domestic fees (indicative): 2010: CSP $2,200 (indicative)
International Fees (indicative): 2010: $11,750 (indicative)

Overview
Geoscience is critical for Australia's future sustainable development. Geoscientists play a leading role in studying climate change and managing environmental issues, such as chronic water shortage, dry land salinity and coastal development. Geological resources are also a major building block of the nation’s economy.

Geoscience provides us with an understanding of earth materials, the natural processes acting in and upon the earth, and its history. You will gain the skills needed to become a professional geologist with special emphasis on the industry–related, hands-on skills acquired through laboratory work and field studies for both resource exploration and environmental applications.

Recommended Study
At least one of the sciences: either Chemistry, Physics, Biological Science, Earth Science or Maths C.

Why Choose this Course
There is currently a shortage of geoscientists in Australia, both in environmental and resource areas. The geoscience major at QUT has been designed to provide hands-on practical skills and field experiences using real-world industry examples and materials. The program provides the fundamental background for you to pursue a geoscience career and has particular strengths in the areas of coal and petroleum resource geology, hydrogeology, and environmental geology – areas of particular importance to Queensland. Many lecturers maintain close links with industry by undertaking consulting projects for industry, government and community groups, or teaching specialist short courses to industry professionals.

Career Outcomes
Employment opportunities exist within a variety of government organisations and consulting companies with work ranging from field geologists to research scientists. Exploration geologists are employed by mining and hydrocarbon exploration companies where they may be involved in underground geological mapping, evaluation of ore reserves, production control, or exploration for new mineral or oil and gas deposits. They may be based in remote settings or major cities. Graduates may work in computing, data modelling and remote sensing in any of these areas.

An honours degree has traditionally been required by many employers including the larger mining and exploration companies.

Professional Recognition
Graduates are eligible for membership of the Australasian Institute of Mining and Metallurgy (AIMM), Australian Institute of Geoscientists (AIG), and the Geological Society of Australia (GSA).

Your Course
Year 1
You will undertake introductory core studies in a range of scientific areas including life sciences, chemistry, physics, mathematics and environmental science to give you a solid foundation for your future studies. You will also select specific units that will help you decide whether to pursue career paths in exploration or environmental geoscience. Following these introductory studies you should be in a position to confirm your choice of major area of study.

Year 2
You will learn fundamental concepts and gain practical experience in identifying and analysing earth materials, both in the laboratory and in the field. At the same time, you will be introduced to the geological processes that govern the evolution of the earth’s surface (sedimentary environments). You will then be introduced to rocks and processes that occur deeper within the earth (igneous and metamorphic...
realms) and longer term geological processes including structural deformation and stratigraphic evolution. The year culminates with you being able to solve real-world geological problems based on data you collect in the field.

**Year 3**

You will receive more advanced training in the fundamental areas of petrology and geochemistry with the addition of exploration geophysics and specialised units relevant to the mining, coal, petroleum and/or hydrogeology-environmental industries. You will be introduced to techniques and case studies that will prepare you for a wide variety of career paths. At the same time, you will learn new skills in subsurface analysis and mapping, remote sensing, and spatial analysis, including computer-based geographic information systems.

**Geoscience Full-time Course Structure: First Semester Entry**

<table>
<thead>
<tr>
<th>Year 1, Semester 1</th>
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<tbody>
<tr>
<td>SCB110 Science Concepts and Global Systems</td>
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<tr>
<td>SCB111 Chemistry 1</td>
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<tr>
<td>SCB112 Cellular Basis of Life</td>
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<tr>
<td>MAB101 Statistical Data Analysis 1</td>
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<tr>
<td>MAB105 Preparatory Mathematics</td>
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<tr>
<td>MAB120 Algebra and Calculus</td>
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<tr>
<td>MAB121 Calculus and Differential Equations</td>
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**NOTE:**

1. Students with a Sound Achievement (4 semesters) in Maths A should enrol in MAB105
2. Students with a Sound Achievement in Maths B and NOT wishing to major in Physics should enrol in MAB101.
3. Students with a Sound Achievement in Maths C and wishing to major in Physics should enrol in MAB121.
4. Students without a Sound Achievement in Maths C and wishing to major in Physics should enrol in MAB120.
5. Students without a Sound Achievement in Maths B or Maths A should consult with the course coordinator.

<table>
<thead>
<tr>
<th>Year 2, Semester 2</th>
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<tbody>
<tr>
<td>NQB201 Planet Earth</td>
</tr>
<tr>
<td>NQB202 History of Life on Earth</td>
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<tr>
<td>SCB123 Physical Science Applications</td>
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<tr>
<td>SCB222 Exploration of the Universe</td>
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**Year 2, Semester 2 * **

- NQB311 Mineralogy
- NQB314 Sedimentary Geology
  - Plus TWO other units selected according to the second major requirements

**Recommended Second Majors:**

- Applied Geology, Environmental Science, Physics

* Elective Unit for all Majors:

| SCB500 Industry Project |

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| SCB500 Industry Project |

**Mid-Year (July) Entry**

FOR DOMESTIC STUDENTS: Due to the careful construction of scientific knowledge demanded in the SC01 degree, mid-year entry requires some compromises. There are two ways to construct a mid-year program:

1. Take foundation units and their follow-up units together, rather than in sequence. This will be very challenging, but will allow you to start second year units at the start of the next
manipulating probability; independence; Binomial and Normal distributions; population parameters and sample statistics; concepts of estimation and inference; standard error; confidence intervals for means and proportions; tests of hypotheses on means and proportions (one sample and two independent samples); inference using tables of counts; modelling relationships using regression analysis; model diagnosis; use of statistical software.

**Antirequisites:** BSB123, EFB101, MAB141, MAN101

**Assumed knowledge:** Grade of at least Sound Achievement in Senior Mathematics B (or equivalent) or MAB105 is assumed knowledge.

**Credit points:** 12

**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SUM-2, 2010 SEM-1 and 2010 SEM-2

**MAB105 PREPARATORY MATHEMATICS**

This unit is a substitute for Senior Mathematics B for those students who need the equivalent background for the successful study of units which assume it. It includes: basic number facts, natural numbers, integers, rational numbers, real numbers and their operations; basic algebra; functions and equations, graphs, linear functions, equations and applications; systems of linear equations; quadratic, exponential, logarithmic and trigonometric functions, properties and applications; introduction to calculus; rates of change, derivatives, rules of differentiation, second derivatives, maxima and minima and applications; integration and applications. This unit is incompatible with an exit assessment of High Achievement or better in Senior Mathematics B.

**Assumed knowledge:** Year 10 Level 6 Mathematics is assumed knowledge  
**Credit points:** 12

**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-1 and 2010 SEM-2

**MAB120 ALGEBRA AND CALCULUS**

This unit introduces and reviews the elementary concepts of function, calculus, matrices and vectors with special reference to applications in science, technology and business where appropriate. Topics covered include the algebra of complex numbers, elementary functions (polynomial, trigonometric, exponential and logarithmic) and their properties, differentiation and integration methods and principles, geometric and algebraic applications of vectors and the solution of linear systems using matrices.

**Assumed knowledge:** Grade of at least Sound Achievement in Senior Mathematics B (or equivalent) or MAB105 is assumed knowledge

**Equivalents:** MAB100, MAB125, MAB180

**Credit points:** 12

**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-1, 2010 SEM-2 and 2010 SUM

**MAB121 CALCULUS AND DIFFERENTIAL EQUATIONS**
This unit extends the areas of function and calculus introduced in MAB120 by introducing series representations for functions and more advanced methods of differentiation and integration for functions of one variable. A strong connection to real world problems is made by introducing the use of differential equations in modelling, and exploring appropriate methods of solution. Practical calculations of volumes and surface areas of solids of revolution extend your interpretations of the definite integral. Taylor and Fourier series are introduced as a means of approximating functions by sums of polynomials and periodic functions. Some more advanced methods for indefinite integrals, such as partial fraction decomposition, are also introduced.

**Assumed knowledge:** Grade of at least Sound Achievement in Senior Mathematics C (or equivalent) or MAB125 or MAB180 or MAB120 is assumed knowledge

**Equivalents:** MAB111, MAB126

**Credit points:** 12

**Contact hours:** 4 per week

**Campus:** Gardens Point

**Teaching period:** 2010 SEM-1, 2010 SEM-2 and 2010 SUM

### NQB201 PLANET EARTH

Earth Science impacts every aspect of modern life. Hence, the concepts of Earth Science are fundamental not only to the field of Geology, but also to Environmental Science, natural resource management, civil engineering and society at large. Planet Earth provides an introduction to Earth Science, including earth materials, geologic history, geological process at the Earth's surface, and the complex interplay between the lithosphere, atmosphere, hydrosphere and biosphere through geologic time. Thus, Planet Earth is a foundation unit for further studies in Geology and Environmental Science and also serves as a broad introduction to the world we live on.

**Equivalents:** NRB230

**Credit points:** 12

**Contact hours:** 4 per week

**Campus:** Gardens Point

**Teaching period:** 2010 SEM-2

### NQB202 HISTORY OF LIFE ON EARTH

This unit provides an introduction to the history and development of life on Earth with an emphasis on fundamental biological and ecological principles as they have operated through geological time. The unit provides the student with an understanding of the processes of evolution, extinction and the changing environmental conditions through Earth's history. The unit provides the student with practical experience in fossil identification, classification and morphological interpretation. It provides the student with a "deep-time" perspective of climate and other environmental changes affecting modern ecosystems. Hence, History of Life on Earth is a foundation unit for the Earth and Environmental Sciences as well as Ecology, Biological Sciences and Education.

**Equivalents:** NRB240

**Credit points:** 12

**Contact hours:** 4 per week

**Campus:** Gardens Point

**Teaching period:** 2010 SEM-2

### NQB311 MINERALOGY

Minerals are the building blocks of rocks which comprise the solid Earth. The study of minerals is essential for understanding the structure and composition of the earth and the detailed processes of the rock cycle. Mineralogy forms the basis for petrology (the study of the genesis of rocks) and geochemistry, and is thus essential for Geoscience. The unit may also be of interest to chemists.

**Equivalents:** NRB333

**Credit points:** 12

**Contact hours:** 4 per week

**Campus:** Gardens Point

**Teaching period:** 2010 SEM-1

### NQB314 SEDIMENTARY GEOLOGY

This unit provides students with an introduction to sedimentology; both sediments and sedimentary rocks. The unit focuses on the link between the range of features preserved in sedimentary rocks and what those features tell us about sedimentary processes, depositional environments and the burial history of the rocks. The sedimentological processes and depositional environments observed in the modern world are discussed and used as a foundation for interpreting the evidence preserved in the ancient sedimentary rock record, in turn revealing much about earth processes in geologic history.

**Assumed knowledge:** NQB201 is assumed knowledge.

**Equivalents:** NRB331

**Credit points:** 12

**Contact hours:** 4 per week

**Campus:** Gardens Point

**Teaching period:** 2010 SEM-1

### NQB411 PETROLOGY OF IGNEOUS AND METAMORPHIC ROCKS

This unit includes an introduction to the description, classification and origin of igneous and metamorphic rocks and practical development of lithologic and petrographic abilities to identify mineral assemblages, classify rocks, and interpret textures. Field and theoretical constraints on the petrogenesis of rocks are discussed in lecture. Field study is an essential component of the unit. This unit builds upon the knowledge and skills acquired in the prerequisite unit (NQB311 Mineralogy).

**Prerequisites:** NQB311 or NRB333

**Equivalents:** NRB436

**Credit points:** 12

**Contact hours:** 4 per week

**Campus:** Gardens Point

**Teaching period:** 2010 SEM-2

### NQB412 STRUCTURAL GEOLOGY AND FIELD METHODS

Structural geology, the deformation of earth materials, is one of the main elements in the core curriculum in geology. It is also essential to other subdisciplines of geology, such as foundation engineering and petroleum and mineral exploration. Geologists need to be able to describe and map structures, to understand the mechanical principles of rock deformation, and to be able to manipulate and calculate...
NQB502 FIELD METHODS IN NATURAL RESOURCE SCIENCES
Field experience is an essential part of the professional training of geologists, environmental scientists, ecologists, and natural resource specialists in general. The theory and practice of methods to interpret, measure, map, and monitor important natural resource features and characteristics are essential to the study of geological, ecological and environmental systems. Methods of survey, mapping and interpretation are necessary skills for resource assessment, geo-exploration, environmental impact assessment, land evaluation, baseline studies, and ecological investigations. There are varying emphases on these outcomes depending on the type of field survey you undertake in this unit.
Prerequisites: (NQB321 or NQB411) and (NQB302 or NQB412)  Assumed knowledge: 36 credit points of second level science units in selected major is assumed knowledge. NQB302 and NQB403 for Env Sc, NQB321 for Ecol, NQB411 and NQB412 for Geosc  Equivalents: NRB501  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2010 SEM-1

NQB513 GEOPHYSICS
Geophysics is an integral branch of geology, providing many of the most useful methods of imaging the subsurface of the earth. These methodologies are useful in disciplines as diverse as plate tectonics, oil and mineral exploration, hydrogeology, environmental geology, engineering geology, and seismic hazards.
Prerequisites: (NQB201 or NRB230) and (NQB412 or NRB434)  Equivalents: NRB534  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2010 SEM-1

NQB612 BASIN ANALYSIS AND PETROLEUM GEOLOGY
This unit provides students with a fundamental working knowledge of sedimentary strata at regional and basin-wide scales, and enables them to solve problems in the exploration for hydrocarbons and other stratabound resources. It deals with the tectonic settings, styles of subsidence, patterns of sedimentary fill, thermal and diagenetic histories and resource distribution within sedimentary basins. Integrated lithostratigraphic, biostratigraphic, sequence stratigraphic, geophysical, and geochemical data sets are introduced as fundamental aspects of basin analysis. The unit develops an understanding of exploration and production aspects of the oil and gas industries.
Prerequisites: (NQB413 or NRB437) and (NQB513 or NRB534). NQB513 can be studied in the same teaching period as NQB612  Equivalents: NRB636  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2010 SEM-2

NQB613 PLATE TECTONICS
This unit considers geological observations in the context of a unifying theory. It examines lithospheric plates, plate geometries, Earth morphology, relative and absolute plate movements, stresses of plate interactions, types of plate boundaries, and orogenesis. It also examines the development of the most important geologic theory of the 20th century.
Prerequisites: (NQB412 or NRB434) and (NQB314 or NRB331) and (NQB411 or NRB436) and (NQB513 or NRB534). NQB513 can be studied in the same teaching period as NQB613  Equivalents: NRB635  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2010 SEM-2

NQB614 GROUNDWATER SYSTEMS
This unit focuses on the origin, occurrence and movement of groundwater; aquifer properties; chemistry and quality of groundwater; exploration methods for groundwater; drilling methods and well testing equipment; assessment of groundwater problems, both supply and quality; and introduction to modelling of groundwater systems. Groundwater resources of Australia are covered and current issues. Lectures are supported by desktop exercises. Students will obtain practical experience with pump tests and computer modelling. There is interaction with government and private sector hydrogeologists, and a field site visit for hands-on well testing.
Prerequisites: NQB302 or NRB301 or ENB383  Equivalents: NRB633  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2010 SEM-2

NQB615 GEOCHEMISTRY
Through lecture, discussion and problem solving exercises, this unit introduces the application of geochemistry, phase equilibria, and thermodynamics to demonstrate the origin and evolution of igneous and metamorphic rocks. Problem-solving exercises synthesise field, petrographic and geochemical data to develop quantitative petrogenetic models and enhance critical thinking and written communication skills. Field study is an important component of this unit.
Equivalents: NRB536  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2010 SEM-2

SCB110 SCIENCE CONCEPTS AND GLOBAL SYSTEMS
You will undertake interdisciplinary study of the physical, geological and biological concepts relating to the origins of
life; from the creation of matter and planets, to the emergence of life in all its complexity, culminating in evolution of earth ecosystems. Human influences, overlaid upon earth’s complex systems, will be examined as to their type, extent, and impact. In counterpoint, you will explore the breadth of philosophical developments underlying our search for knowledge; fundamental thoughts and ideas that span the last 2,500 years of human history. Ultimately, these concepts evolved through the development of a scientific method and we explore its workings in relation to the ongoing enterprise of human understanding.

Credit points: 12  Contact hours: 4.5 per week  
Campus: Gardens Point  Teaching period: 2010 SEM-1

SCB111 CHEMISTRY 1
This unit covers the fundamentals of general and physical chemistry. Topics include atomic and molecular structure, introduction to chemical bonding, reaction stoichiometry, thermochemistry, gas phase chemistry, reaction kinetics, equilibrium, acids, bases, buffers, oxidation, reduction and electrochemistry. The practical program involves experiments illustrating a range of chemical reaction types including precipitation reactions, acid-base chemistry and redox chemistry using analytical experimental methods. A comprehensive tutorial program (CHELP) complements the lectures and is designed to assist students to develop the problem solving skills required for further study in chemistry and related sciences.

Antirequisites: SCB113  Credit points: 12  Contact hours: 4.5 per week  
Campus: Gardens Point  Teaching period: 2010 SEM-1 and 2010 SEM-2

SCB112 CELLULAR BASIS OF LIFE
A study of life processes in all five groups of living organisms (bacteria, protists, fungi, plants and animals). Traditional topics in biology are integrated with recent research advances in molecular and cellular biology to provide a comprehensive foundation for later units in the medical, biotechnological and ecological sciences. The unit begins by constructing cells from the four quantitatively important groups of biological molecules (proteins, lipids, carbohydrates and nucleic acids). Molecular and evolutionary aspects of genetics are then introduced, with the great diversity of reproductive strategies found among organisms being emphasised. Finally, bioenergetics (photosynthesis and respiration) and its relevance to environmental issues is outlined.

Antirequisites: LSB118  Credit points: 12  Contact hours: 4 per week  
Campus: Gardens Point  Teaching period: 2010 SEM-1 and 2010 SEM-2

SCB123 PHYSICAL SCIENCE APPLICATIONS
Physics principles underpin all of the sciences and ‘new technologies’. This unit adopts an investigative team-based approach to provide students with an appreciation of fundamental concepts in physical science, together with experience in the application of these concepts to a range of ‘real world’ problems. The unit should be taken in the first year of study as the fundamental principles introduced here will be built upon in later units in the context of each science student’s major discipline area. Employers in cutting-edge industries expect science graduates to have effective strategies for problem solving, skills for collaborative work and scientific communication and research skills. This unit aims to develop these skills by applying the fundamental concepts of physical science to problems in a team environment.

Credit points: 12  Contact hours: 4.5 per week  
Campus: Gardens Point  Teaching period: 2010 SEM-1 and 2010 SEM-2