Bachelor of Applied Science (Ecology) (SC01)

Year offered: 2011
Admissions: Yes
CRICOS code: 003502J
Course duration (full-time): 3 Years
Course duration (part-time): 6 Years
Domestic Fees (indicative): 2011: CSP $2,178 per semester (indicative)
International Fees (indicative): 2011: $12,250 (indicative)

Domestic Entry: February and July
International Entry: February and July* (Conditions apply for July entry)

QTAC code: 418011
Past rank cut-off: 77
Past OP cut-off: 12

Assumed knowledge: English (4, SA) and Maths B (4, SA)
Preparatory studies: For information on acquiring assumed knowledge visit http://www.qut.edu.au/assumed-knowledge

Total credit points: 288
Standard credit points per full-time semester: 48
Standard credit points per part-time semester: 24

Course coordinator: Dr Marion Bateson
Discipline coordinator: Dr Ian Williamson
Campus: Gardens Point

Career Outcomes
Ecologists find rewarding careers in research and monitoring with government departments responsible for sustainability, wildlife conservation and national parks, primary industries, pest management, fisheries, forestry and museums. They also find work in private firms engaged in research and consultancy. Positions include conservation officer, sustainable resources officer, wildlife manager, fisheries biologist, scientific or technical officer, teacher or research scientist. Employment in more specialised areas is available, usually requiring study beyond the first degree.

Professional Recognition
Professional recognition is achieved through membership of a scientific society, for example, the Ecological Society of Australia (ESA) or the Australian Wildlife Management Society (AWMS) and participation in its meetings and professional activities.

Recommended Study
At least one of the sciences.

Ecology Full-time Course Structure: First Semester Entry

Year 1, Semester 1

SCB110 Science Concepts and Global Systems
SCB111 Chemistry 1
SCB112 Cellular Basis of Life

Plus ONE of:
MAB101 Statistical Data Analysis 1
MAB105 Preparatory Mathematics
MAB120 Algebra and Calculus
MAB121 Calculus and Differential Equations

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.

Year 1, Semester 2 (Ecology and Environmental Science Pre-Major Strand)

NQB201 Planet Earth
NQB202 History of Life on Earth
SCB120 Plant and Animal Physiology

Plus either
SCB121 Chemistry 2
Or
SCB122 Cell and Molecular Biology
Or
SCB123 Physical Science Applications

Year 2, Semester 1

NQB321 Ecology

Plus ONE of:
NQB302 Earth Surface Systems
NQB322 Invertebrate Biology
NQB323 Plant Biology

Plus TWO other units selected according to the second major requirements

Year 2, Semester 2 *
NQB421  Experimental Design
NQB422  Genetics and Evolution
Plus TWO other units selected according to the second major requirements

Year 3, Semester 1 *
NQB521  Population Genetics and Molecular Ecology
NQB523  Population Management
Plus TWO other units selected according to the second major requirements

Year 3, Semester 2 *
NQB622  Conservation Biology
NQB623  Ecological Systems
Plus TWO other units selected according to the second major requirements

Recommended Second Majors:
- Biodiversity, Environmental Science

* Elective Unit for all Majors except Forensic Science:
SCB500  Industry Project
NOTE: SCB500 Industry Project is a unit that will be offered as an elective in all majors. This unit requires 84 credit points of Level 2 and/or 3 Science units, so it may only be taken at the completion of Year 2 in Summer or during Year 3.

Ecology Full-time Course Structure: Mid-Year Entry

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 year. Please contact either the course coordinator or the discipline coordinator to devise a suitable program of study. Please note: as this option usually involves taking units from different levels concurrently, which may not be possible to complete within the standard time frame.
2. Take three units per semester for the first three semesters, adding one semester to your degree completion time. This allows you to do your first year units in the correct sequence, at a slightly more leisurely pace, while still being officially a full-time student. You may enrol in a fourth unit (level 2 unit from your chosen major) provided you have the necessary pre-requisites. This is the recommended option.
FOR INTERNATIONAL STUDENTS: Mid-year entry is only available under certain circumstances. Please contact the Course Coordinator to discuss available midyear entry and advance standing options on a case by case basis.

Year 1, semester commencing July
NQB201  Planet Earth
SCB112  Cellular Basis of Life
SCB120  Plant and Animal Physiology
NOTE: Students wishing to enrol in four units should add either MAB101 or MAB105 and contact the discipline coordinator for a modified program for subsequent semesters.

Year 2, semester commencing February
NQB302  Earth Surface Systems
SCB110  Science Concepts and Global Systems
Plus either
MAB101  Statistical Data Analysis 1
Or
MAB105  Preparatory Mathematics

Year 2, semester commencing July
NQB202  History of Life on Earth
SCB111  Chemistry 1
SCB123  Physical Science Applications

Ecology Part-time Course Structure

Students interested in undertaking this major part-time should consult the discipline coordinator.

UNIT SYNOPSES

MAB101 STATISTICAL DATA ANALYSIS 1
Experiments, observational studies, sampling, and polls; data and variables; framework for describing and 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, MAB233  **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:** 2011 SUM-2, 2011 SEM-1 and 2011 SEM-2

MAB105 PREPARATORY MATHEMATICS
This unit is intended to cater for the needs of students whose background in mathematics is either weak or does not reach the equivalent of Senior Mathematics B. It is intended to provide the concepts and skills needed for successful study of those units within the university which assume a background equivalent to Senior Mathematics B. This unit is incompatible with a grade of High Achievement in Senior Mathematics B. The aim of this unit is to develop your mathematical skills in and understanding of algebra, functions and graphing, differential and integral calculus of one variable and to interpret and solve simple, real world problems using these skills.  **Assumed knowledge:** Year 10 Level 6 Mathematics is assumed knowledge  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2011 SEM-1 and 2011 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.  **Antirequisites:** MAN120  **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:** 2011 SEM-1, 2011 SEM-2 and 2011 SUM

MAB121 CALCULUS AND DIFFERENTIAL EQUATIONS
Building upon the foundations established in MAB120 or Senior Maths C, this unit addresses the significant role of mathematical modelling using differential equations for the description and resolution of simple and complex problems relevant to real world situations. The formulation and solution of such problems is supported by appropriate advanced mathematical concepts used for function approximation, differentiation and integration. Undertaking this unit will allow you to develop your problem solving skills, especially in the context of advanced mathematical techniques applied to ordinary differential equations used to model real world problems. You will also gain a deeper understanding of the concepts of the derivative and the integral, and how these may be used in applied contexts.  **Antirequisites:** MAN121  **Assumed knowledge:** Grade of at least Sound Achievement in Senior Mathematics C (or equivalent) or MAB120 or MAB100 or MAB125  **Equivalents:** MAB111, MAB126, MAB131, MAB182  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2011 SEM-1, 2011 SEM-2 and 2011 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:** NRB220  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2011 SEM-2

NQB202 HISTORY OF LIFE ON EARTH
This unit aims to provide you with an understanding of the processes of evolution and the changing environmental conditions through time that influenced the patterns of the evolution of life on this planet. The unit will provide you with practical experience in fossil plant and animal identification, classification and morphological interpretation. It will also enable you to apply palaeontological information to interpret the evolutionary history of higher taxa and the changing ancient depositional environments through time.  **Equivalents:** NRB240  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2011 SEM-2

NQB302 EARTH SURFACE SYSTEMS
Understanding long and short term climate and environmental change is now recognised as crucial to the interpretation of our biotic, geomorphic and cultural landscapes. To fully understand environment change it is important to recognise the interconnectedness between the atmosphere, hydrosphere, lithosphere, biosphere and humanity's place within these spheres over various temporal and spatial scales. Developing knowledge of past
and present climate change and landscaping processes helps to predict future process pathways for natural resource management, civil engineering, risk analysis, and impact assessment in the context of both natural and anthropogenic induced change.

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

**Equivalents:** NRB301  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**NQB321 ECOLOGY**
Ecology is the study of the factors that influence the distribution and abundance of organisms. Ecology deals with basic properties of individuals and the emergent properties of collections of individuals that form populations and the dynamics of these populations and their interactions with populations of other species. An understanding of basic ecological principles is central to managing species and ecosystems. This unit provides a broad theoretical background in the major concepts of plant and animal ecology. It serves the dual role of providing a thorough grounding in ecology for students from all faculties; and laying the conceptual foundation for later subjects in the ecology and environmental science.

**Prerequisites:** SCB110 or SCB112  
**Equivalents:** NRB311  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**NQB322 INVERTEBRATE BIOLOGY**
Anyone pursuing a career as an ecologist, environmental biologist, or teacher needs to be familiar with invertebrates, including their diversity and how they function. Because approximately 90% of all invertebrates are arthropods, this unit focuses on this dominant phylum, which includes all the animals with jointed exoskeletons (the insects, prawns and crabs, spiders, millipedes and more). The aim is to provide you with an overview of arthropod diversity, structure and function, as a basis for exploring the role of arthropods in natural and human-modified systems.

**Equivalents:** NRB370  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**NQB323 PLANT BIOLOGY**
This unit will provide an understanding and appreciation of plants by taking an evolutionary approach to the study of major plant groups. Content includes life cycles, morphology, adaptations for survival in varied environments, economic and ecological aspects of various groups as they relate to humans, phylogeny and diversity of major groups. This unit will encourage careful observation, curiosity and thinking about plants. The practicals will provide an opportunity to observe and understand form, function and diversity and will emphasise development of skills in plant systematics and identification, with special emphasis on Australian flora.

**Prerequisites:** SCB112  
**Equivalents:** NRB371  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**NQB421 EXPERIMENTAL DESIGN**
This unit deals with the theory and practice of experimental design and the quantitative approaches used for the investigation of ecological and environmental questions discussed in the prerequisite unit Ecology and developed in subsequent units in the ecology and environmental science majors. The aims of this unit are to provide an introduction to the logic of experimentation and experimental design; build a practical extension on the theoretical basis of statistics obtained in other units using experimental situations commonly met in ecology and environmental science; and apply methods used to quantify the ecological attributes of populations and communities in experimental field situations.

**Prerequisites:** MAB101 or MAB104 or MAB105 , and NQB321 or NRB311  
**Equivalents:** NRB412  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

**NQB422 GENETICS AND EVOLUTION**
A detailed understanding of the principles of genetics is required to fully comprehend modern developments in ecology and evolutionary theory. These principles will be taken forward to develop a clear understanding of the mechanisms and processes that drive evolution in natural populations. The unit provides the foundation for further studies in population and conservation biology. The aim of the unit is to provide a detailed understanding of the principles of genetics and their application to studies of evolution and ecology.

**Prerequisites:** SCB112  
**Equivalents:** NRB410  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

**NQB521 POPULATION GENETICS AND MOLECULAR ECOLOGY**
This unit is an extension of NQB422 Genetics and Evolution. Topics include the genetic structure of populations and processes of evolutionary change; natural selection, inbreeding and adaptation, species and speciation theory; ecological genetics; the genetics of behaviour.

**Prerequisites:** NQB422  
**Antirequisites:** NRB510  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**NQB523 POPULATION MANAGEMENT**
This unit develops the theoretical treatment of populations as a unit of study and integrates the content of previous
ecology units into approaches for the management of biological populations. The unit focuses on those interactions that are most relevant to pest control, but the unit is also of fundamental importance to harvesting and conservation biology.

**Prerequisites:** NQB321, NQB421  
**Antirequisites:** NR5B11  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**NQB622 CONSERVATION BIOLOGY**
Conservation Biology is the application of ecological theory and principles to the problem of the maintenance of viable populations of rare, threatened or endangered species, or ecological systems. The unit integrates ecological and genetic material covered in earlier units to provide an understanding of factors that enable the maintenance or enhancement of populations. The unit examines biodiversity and its determinants, the process of extinction, population viability analysis and the diagnosis and treatment of population declines, habitat fragmentation, metapopulation processes and the design of natural reserves, and conservation genetics.

**Prerequisites:** NQB321 or NR3B311, and NQB422 or NR5B410  
**Equivalents:** NR5B611  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

**NQB623 ECOLOGICAL SYSTEMS**
The science of ecology examines the distribution and abundance of organisms at a number of organisational levels from individuals to landscapes. At each of these levels there are separate and distinct attributes that require investigation and explanation. One important level of organisation is the ecosystem. An essential component of ecological studies is to examine these ecological systems and how they are shaped by the interaction between their constituent species and the physical environment. This unit builds on aspects animal and plant diversity and ecology covered in previous units to examine how the interrelationships between key physical, ecological, biological and geological processes shape ecological systems. The aim of this unit is to develop an understanding of the structure and function of terrestrial and aquatic ecosystems, and especially the processes that have shaped Australia's major ecological systems.

**Prerequisites:** NQB321 or NR3B311  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 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:** 2011 SEM-1

**SCB111 CHEMISTRY 1**
Chemistry is the central science. It affects society as well as the individual. It is the language and principal tool of the physical sciences, the biological sciences, the health sciences and the agricultural and earth sciences. A basic knowledge of chemistry is essential to all students in these areas. Knowledge of chemistry allows a better understanding of the human body and of the environment in which we live. The aim of this unit is to introduce you to the basic concepts of general, inorganic, analytical and physical chemistry.

**Antirequisites:** SCB113  
**Credit points:** 12  
**Contact hours:** 4.5 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1 and 2011 SEM-2

**SCB112 CELLULAR BASIS OF LIFE**
Scientists from all disciplines need an appreciation and a broad overview of the characteristics and functioning of the five groups of living organisms (bacteria, protists, fungi, plants and animals), and their interactions with the inanimate world. SCB112 Cellular Basis of Life is a first semester unit that is essential for many students undertaking courses requiring biological knowledge. Through integrated lecture and laboratory classes, this unit provides you with a foundation for later more advanced studies in your course or major (eg such as medical science, biomedical science, pharmacy, optometry, biochemistry, biotechnology, microbiology, geosciences, ecology, business and education among others). The aim of this unit is to introduce you to the wide diversity of living organisms while emphasising the unity of life processes at the cellular, biochemical and biophysical levels.

**Antirequisites:** LQB182, LSB118  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1 and 2011 SEM-2

**SCB120 PLANT AND ANIMAL PHYSIOLOGY**
Regardless of which area of biology you decide to specialise in, you will need to understand the complex interactions between cells, tissues, organs and organ systems that comprise multi-cellular organisms. Although many living processes can be explained at the levels of biochemistry, biophysics and cell biology, a true
understanding of complex, multicellular organisms requires integration of knowledge drawn from all of these areas, combined with the more complex physiological and structural levels you will learn about in this unit. The knowledge gained in this and other first level units provides you with the conceptual framework necessary to understand processes occurring from the cellular to the whole organism level and to higher levels of organisation.

**Prerequisites:** SCB112 **Equivalents:** NRB270  
**Credit points:** 12  
**Contact hours:** 4.5 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

**SCB121 CHEMISTRY 2**  
Chemistry is the central science. This is a unit of fundamental importance as it covers the background and general principles that underpin understanding in many science and health related disciplines. In this unit you will be introduced to fundamental aspects of chemistry including the nature of matter, atoms, molecules and ions. From this basis you will develop an understanding of the electronic structure of atoms, chemical bonding and molecular structure as well as the fundamentals of organic chemistry (often described as the chemistry of life). The aims of this unit are to generate an understanding of the importance of chemical bonding and molecular structure and how these factors effect the properties of organic and bioinorganic molecules; and to allow recognition of, and provide an understanding of, the nature of organic functional groups and their respective reactivity.

**Prerequisites:** (SCB111 or PCB142)  
**Antirequisites:** PQB105 and SCB113  
**Credit points:** 12  
**Contact hours:** 4.5 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

**SCB122 CELL AND MOLECULAR BIOLOGY**  
SCB122 Cell and Molecular Biology 1 equips students with a comprehensive understanding the molecular basis of the cell. This unit expands on the basic principles and concepts relating to cell structure, function, perpetuation and specialisation introduced in SCB112 and introduces students to fundamental molecular mechanisms central to the organisation of the cell. Students will be shown how macromolecular interactions are crucial to information flow and heredity. Students are taught the relationships between chromosomes, genes and cellular function and ultimately how these may determine an organism's phenotype. This unit underpins cell biology and molecular biology units that are offered in second year Life Science units. SCB122 is also ideal for interfaculty students (eg Education, Business, Arts) who will undertake no further life science studies.

**Prerequisites:** SCB112  
**Antirequisites:** LSB238  
**Credit points:** 12  
**Contact hours:** 4.5 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 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:** 2011 SEM-2

**SCB500 INDUSTRY PROJECT**  
In this unit students will apply scientific methods and quantitative techniques to real work issues. Students will develop an appropriate plan for analysing and resolving an industry issue under the guidance of both a QUT supervisor and an associate supervisor from an industry partner. At the end of the unit students will present both an oral seminar and a written report.

**Credit points:** 12  
**Contact hours:** 52  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1, 2011 SEM-2 and 2011 SUM