Bachelor of Applied Science (Microbiology) (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) per semester
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
OP Guarantee: Yes
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 Christine Knox
Campus: Gardens Point

Career Outcomes
Microbiology graduates find employment in a variety of interesting careers. Many microbiologists are employed by human pathology laboratories with the departments of bacteriology, immunology, mycology, parasitology and virology. You may also find employment in laboratories testing for animal and plant diseases, or testing for pathogens or spoilage organisms in food, air, water and soils. Microbiologists can also be employed as metabolic engineers developing microbial production systems.

If working in a laboratory is not for you then there are positions available as technical product and sales representatives, intellectual property specialists/patent attorneys, or even with scientific publishers. Many microbiologists find employment within government departments such as Health, Employment, Economic Development and Innovation, and Environment and Resource Management.

If you wish to study for a higher research degree, you may pursue a research career in university, government or private research laboratories.

Professional Recognition
Graduates are eligible for membership of the Australian Society for Microbiology (ASM).

Recommended Study
Biological Science and Chemistry.

Microbiology 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 without 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 2, Semester 1
SCB120  Plant and Animal Physiology
SCB121  Chemistry 2
SCB122  Cell and Molecular Biology
SCB123  Physical Science Applications

Year 1, Semester 2 (Life Sciences Pre-Major Strand)
SCB120  Plant and Animal Physiology
[Note: students taking forensic science or chemistry second majors should replace SCB120 Plant and Animal Physiology with SCB131 Experimental Chemistry].
SCB121  Chemistry 2
SCB122  Cell and Molecular Biology
SCB123  Physical Science Applications

Year 2, Semester 1
LQB381  Biochemistry: Structure and Function
LQB386  Microbial Structure and Function
Microbiology 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 timetable appropriately, in some cases it 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.

* 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.

Recommended Second Majors:

Biochemistry, Biotechnology, Forensic Science, Life Science Technologies

UNIT SYNOPSES

LQB381 BIOCHEMISTRY: STRUCTURE AND FUNCTION

Published on: 13 June 2012
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This unit extends basic organic chemistry theory to the level of the biological macromolecules. A clear understanding of the structure and function of these molecules is essential to a student’s understanding of the metabolism of living cells. Hence this biomolecular unit is a fundamental prerequisite for all advanced units in the various disciplines in the field of life sciences.

**Prerequisites:** (SCB121 and SCB122) or (SCB111 and SCB121) or SCB113  **Antirequisites:** LSB275 and LSB325 and LSB308  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2011 SEM-1

**LQB386 MICROBIAL STRUCTURE AND FUNCTION**

Aspects of microbiology impinge upon many facets of daily life, for example, human health, genetic engineering, the food industry and the built and natural environment. The unit introduces you to and provides you with a solid foundation in the basic microbiology required for progression to advanced studies in Microbiology. This unit provides knowledge about safe handling and study of micro-organisms that is also very important in many other disciplines, because micro-organisms are used as models and tools in a wide range of study areas.

**Prerequisites:** SCB112 and (SCB121 or SCB113)  **Antirequisites:** LSB328  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2011 SEM-1

**LQB483 MOLECULAR BIOLOGY TECHNIQUES**

Molecular biology and recombinant DNA technologies have important roles in many areas within the life sciences, including medicine, agriculture, cell biology, environmental science and forensics. Through close alignment of theoretical concepts and practical skills, this lab-based unit expands on molecular themes introduced in earlier cell and molecular biology units to develop expertise in modern recombinant DNA techniques and an understanding of strategies used to identify and manipulate genes. The close relationship between theory and practice in this unit is designed to develop competence, independence and critical thinking that will provide students with a solid foundation for advanced molecular biology studies presented in several third level units.

**Prerequisites:** LSB238 or SCB122  **Antirequisites:** LSB468, LSN468, LSN483  **Assumed knowledge:** LSB383 is recommended prior study  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2011 SEM-2

**LQB486 CLINICAL MICROBIOLOGY 1**

Micro-organisms are very important as pathogens of humans and animals, and their accurate clinical diagnosis is essential for appropriate treatment and management of infections. This unit builds upon the foundational topics in microbiology that you learned in LQB386 (Microbial Structure and Function) and starts preparing you for a career in a microbiology laboratory in clinical practice, industry or research. The unit will advance your knowledge and skills in classical methods of isolation and identification of bacteria in clinical specimens and introduce aspects of microbial pathogenesis and antibiotic sensitivity. The unit will provide you with an understanding of clinically important viruses, and will commence your training in diagnostic parasitology.

**Prerequisites:** LQB386 or LSB328  **Antirequisites:** LSB435, LSB547  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2011 SEM-2

**LQB586 CLINICAL MICROBIOLOGY 2**

Clinical microbiology laboratories throughout the world are recognising the need to maximise their diagnostic capabilities for accurate and early detection and management of medically-important parasitic, fungal and bacterial diseases of humans. This unit emphasises a strong commitment to professional practice by: (i) providing you with a comprehensive, in-depth knowledge and understanding of infectious disease states and their etiology, (ii) developing high level generic and specific laboratory-based skills in diagnostic microbiology and (iii) developing and refining critical thinking skills so that experimental results may be observed and recorded intelligently and reported with a high degree of confidence in their validity and rigor.

**Prerequisites:** LQB486  **Antirequisites:** LSB547 and LSB647  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2011 SEM-1

**LQB587 APPLIED MICROBIOLOGY 1: WATER, AIR AND SOIL**

Issues relating to microbial populations within the environment are of great interest and relevance to the community, and also to scientists. Building on the foundation of basic microbiology, in this advanced level unit you will gain a strong understanding of the nature of microbial populations in water, air and soil, and their importance to the human population. This unit is issues-based, encouraging a problem solving approach as you investigate/study microbial pollution, bioremediation, biogeochemical cycles and a healthy environment. You will gain knowledge and skills in analysis and interpretation of water, air and soil populations, which will permit you to investigate real-world problems.

**Prerequisites:** LQB386, LSB328, or LSB492  **Antirequisites:** LSB528  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2011 SEM-1
LQB686 MICROBIAL TECHNOLOGY AND IMMUNOLOGY
This capstone unit builds upon your foundation knowledge and understanding of microorganisms and bioinformatics, molecular technology, and immunological skills. You will: (i) study infectious disease states as a major focus, (ii) research the importance of microbial pathogens as aetiological agents of disease, (iii) apply your knowledge of bioinformatics and molecular assays to design polymerase chain reaction (PCR) assays that can be used to selectively detect and amplify a specific bacterial pathogen, (iii) extend your knowledge of molecular subtyping methods, genomics, manipulation of bacterial genes, antibiotics, human immunology and vaccines, and (iv) write a research report in the format of a journal article.

Prerequisites: LQB386 and LQB483
Antirequisites: LSB648
Credit points: 12
Campus: Gardens Point
Teaching period: 2011 SEM-2

LQB687 APPLIED MICROBIOLOGY 2: FOOD AND QUALITY ASSURANCE
Food microbiology and quality assurance constitute potential areas of employment for graduates. Many aspects of these disciplines are important in public health and operational management. Understanding fundamental concepts and their correct application are critical for food safety and management of both food- and non-food-based operations. This unit with content in applied food microbiology and quality systems, builds on the introduction to food microbiology provided in earlier units. The aim of this unit is to gain advanced knowledge and expertise in food microbiology and fundamental quality assurance principles suitable for application in food and other (bio)technology-based industries.

Prerequisites: LQB386 or LSB328
Assumed knowledge: Completion of 72 credit points of second level science units is assumed knowledge
Equivalents: LSB628
Credit points: 12
Campus: Gardens Point
Teaching period: 2011 SEM-2

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

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
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
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.
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 and 2011 SUM

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 SUM

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 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) . SCB111 can be studied in the same teaching period  Antirequisites: PQB105 and SCB113  Credit points: 12  Contact hours: 4.5 per week  Campus: Gardens Point  Teaching period: 2011 SEM-1 and 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. SCB112 can be studied in the same teaching period.  

**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