Bachelor of Applied Science (Microbiology) (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) per semester
International Fees (indicative): 2010: $11,750 (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.studentservices.qut.edu.au/apply/ug/info/knowledge.jsp
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

Overview

Microbiology is the study of living organisms of microscopic size. In the microbiology course you will study bacteria, fungi, viruses and parasites, and antimicrobial drugs that selectively target these micro-organisms. In microbiology practical sessions you will develop skills that enable you to safely grow, manipulate and identify micro-organisms, and also to visualise micro-organisms using microscopy.

Scientists with the Infectious Diseases Research Program at QUT’s Institute of Health and Biomedical Innovation (IHBI) are working towards the development of effective vaccines, patient-friendly treatment methods and effective diagnostic tests for a range of important bacterial and viral diseases including Chlamydia infections in humans and koalas, asymptomatic upper genital tract infections in infertile invitro fertilisation (IVF) couples, and dengue virus infections. This group is also developing novel testing and diagnosis methods for significant pathogens such as ‘golden staph’ and bacteria which cause meningococcal meningitis and campylobacter gastroenteritis.

Recommended Study
Chemistry and Biological Science.

Why Choose this Course

QUT microbiology lecturers are leaders in infectious diseases research, environmental and food microbiology, and electron microscopy. Your microbiology units will also contain sessions in QUT’s new state-of-the-art microbiology teaching laboratories, to ensure you graduate with the practical skills sought by employers. Small practical class sizes will allow you to gain maximum benefit from your teachers, including some of QUT’s most respected researchers.

You may wish to apply for a Vacation Research Experience Scholarship and gain experience working with research scientists at IHBI.

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. May 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 then 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).

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. Following these introductory studies you should be in a position to confirm your choice of major area of study.
Year 2
You will be introduced to diverse micro-organisms and study how they have evolved, their structure, how they obtain nutrients and how they grow and reproduce. Importantly you will also learn how to control microbial growth by sterilisation, disinfection and using antimicrobials. In practical classes you will learn how to stain and visualise micro-organisms using light microscopy and electron microscopy. You will isolate and culture micro-organisms and learn how to control microbial growth. You will practise identifying micro-organisms by their appearance, biochemical testing or by using molecular assays.

Year 3
Advanced studies will allow you to expand your knowledge and expertise in specialised areas including pathogenesis and disease where you can study bacterial, fungal and parasitic diseases. Other advanced topics include animal and plant viral diseases, food microbiology, molecular microbiology, bioremediation and electron microscopy. You will also cover environmental microbiology which includes the testing of soil, air and water.

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 1, Semester 2
- 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
  - Plus TWO other units selected according to the second major requirements

Year 2, Semester 2 *
- LQB483 Molecular Biology Techniques
- LQB486 Clinical Microbiology 1
  - Plus TWO other units selected according to the second major requirements

Year 3, Semester 1 *
- LQB586 Clinical Microbiology 2
- LQB587 Applied Microbiology 1: Water, Air and Soil
  - Plus TWO other units selected according to the second major requirements

Year 3, Semester 2 *
- LQB686 Microbial Technology and Immunology
- LQB687 Applied Microbiology 2: Food and Quality Assurance
  - Plus TWO other units selected according to the second major requirements

Recommended Second Majors:
- Biochemistry, Biotechnology, Forensic Science, Life Science Technologies

* Elective Unit for all Majors:
- 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.

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 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 prerequisites. 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
SCB111 Chemistry 1
SCB112 Cellular Basis of Life
SCB120 Plant and Animal Physiology

Year 2, semester commencing February
SCB110 Science Concepts and Global Systems
SCB121 Chemistry 2
  Plus either
MAB101 Statistical Data Analysis 1
  Or
MAB105 Preparatory Mathematics

Year 2, semester commencing July
SCB122 Cell and Molecular Biology
SCB123 Physical Science Applications
  Plus either
MAB101 Statistical Data Analysis 1
  Or

Year 3, semester commencing July
SCB124 Molecular Biology
SCB125 Plant and Animal Physiology
SCB126 Plant and Animal Science

UNITSYNOPSSES

LQB381 BIOCHEMISTRY: STRUCTURE AND FUNCTION
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: 2010 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 microorganisms that is also very important in many other disciplines, because microorganisms 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: 2010 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
Increasingly microbiologists are employing emerging technologies to rapidly detect, localise, characterise and identify microorganisms to gain a greater understanding of their prevalence, distribution, physiological functions, genotypes/phenotypes and pathogenesis. This unit will extend your knowledge of the origins of microorganisms and recently sequenced microbial genomes, and provide you with the necessary knowledge for the development and application of emerging microbial technologies. The study of microorganisms is enhanced by an understanding of the host immunological response(s) to microbial colonisation and disease.

**Prerequisites:** LQB386 and LQB483  
**Antirequisites:** LSB648  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

**LQB687 APPLIED MICROBIOLOGY 2: FOOD AND QUALITY ASSURANCE**

This unit covers the most significant areas of food microbiology at an advanced level. Topics include: microbial ecology of foods; microbial spoilage and food preservation; foodborne microorganisms of public health significance; food fermentations; laboratory and food processing operations and certification; predictive microbiology; agriterrorism; and isolation, quantification and identification of microbes from foods. A professional work attitude in a microbiology laboratory, practical, applied laboratory skills and an awareness of the hazards of working with pathogenic cultures are established.

**Prerequisites:** LSB328  
**Assumed knowledge:** Completion of 72 credit points of second level science units is assumed knowledge  
**Equivalents:** LSB628  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

**LQB586 CLINICAL MICROBIOLOGY 2**

**TBA**

**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-1

**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  
**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

MAB110 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 counterpart, 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 SUM

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

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, multcellular 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: 2010 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, particularly in regards to the chemistry of life. In this unit students will be introduced to fundamental aspects of chemistry including the electronic structure of atoms, chemical bonding and molecular structure. From this basis students will develop an understanding of the fundamentals of organic chemistry including chirality, functional groups and organic reactions which will lead to important bio-inorganic molecules and coordination complexes.
Prerequisites: (SCB111 or PCB142). SCB111 can be studied in the same teaching period  Antirequisites: SCB113  Credit points: 12  Contact hours: 4.5 per week  Campus: Gardens Point  Teaching period: 2010 SEM-1 and 2010 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: 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-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: 2010 SEM-1, 2010 SEM-2 and 2010 SUM