Bachelor of Applied Science (Biochemistry) (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 Perry Hartfield
Campus: Gardens Point

Career Outcomes
Strong employment opportunities for biochemists exist around the world in both the private and government sectors of industry. QUT graduates skilled in biochemistry can find career opportunities in diagnostic and analytical laboratories, universities, hospitals and health departments, pharmaceutical companies, primary and agricultural industries and departments, food industry laboratories, environmental agencies, and veterinary pathology laboratories. Alternative career paths in the marketing and sales of biotechnology equipment or commercialisation and management of biological products and processes are available.

For those wishing to enter research in honours and PhD programs, biochemistry offers a huge scope of intriguing and intellectually rewarding projects.

Professional Recognition
Graduates are eligible for membership of the Australian Society for Biochemistry and Molecular Biology (ASBMB), and in some cases the Australasian Association of Clinical Biochemists (AACB).

Recommended Study
Chemistry and Biological Science.

Biochemistry 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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<td>MAB121 Calculus and Differential Equations</td>
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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 (Life Sciences Pre-Major Strand)

| SCB120 Plant and Animal Physiology |
| SCB121 Chemistry 2 |
| SCB122 Cell and Molecular Biology |
| SCB123 Physical Science Applications |

Year 2, Semester 1

| LQB381 Biochemistry: Structure and Function |
| LQB383 Molecular and Cellular Regulation |

Plus TWO other units selected according to the second major requirements
Year 2 Semester 2 *

LQB481 Biochemical Pathways and Metabolism
LQB483 Molecular Biology Techniques
Plus TWO other units selected according to the second major requirements

Year 3, Semester 1 *

LQB581 Functional Biochemistry
LQB582 Biomedical Research Technologies
Plus TWO other units selected according to the second major requirements

Year 3, Semester 2 *

LQB681 Biochemical Research Skills
LQB682 Protein Biochemistry and Bioengineering
Plus TWO other units selected according to the second major requirements

Recommended Second Majors:
- Biotechnology, Chemistry, Forensic Science, Life Science Technologies, Microbiology

* 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.

Biochemistry 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.

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

Or

MAB101 Statistical Data Analysis 1

MAB105 Preparatory Mathematics

Year 2, semester commencing July

SCB122 Cell and Molecular Biology
SCB123 Physical Science Applications

Or

MAB101 Statistical Data Analysis 1

Or

Approved Elective

Biochemistry Part-time Course Structure

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

UNIT SYNOPSISES

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:** 2011 SEM-1

**LQB383 MOLECULAR AND CELLULAR REGULATION**  
Molecular and Cellular Regulation is a second year unit and is a continuation and expansion of topics introduced in SCB112 Cellular Basis of Life and SCB122 Cell & Molecular Biology. Molecular and Cellular Regulation strengthens the focus on the molecular and genetic aspects of cellular processes and the consequences to the organism of failure of these basic processes. Topics taught relate to gene structure and regulation in prokaryotes and eukaryotes and the role of gene expression in the development of complex organisms. Related concepts such as cell signalling, communication, proliferation and survival are further developed in this unit.  

**Prerequisites:** SCB122 or LSB238  
**Antirequisites:** LSB468 and LSB338  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**LQB481 BIOCHEMICAL PATHWAYS AND METABOLISM**  
The study of biochemistry and cell biology, along with molecular biology, provides students with the knowledge required for the proper understanding of the structure and function of living organisms at the molecular level. As such, this unit extends the studies begun in the unit LQB381 Biochemistry into the metabolic processes occurring in living cells, and provides students with a basis for further studies in biochemistry as well as support for other units in the third year of the course.  

**Prerequisites:** LQB381 or LSB308  
**Corequisites:** PUB405  
**Antirequisites:** LSB275, LSB325, LSB408  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

**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, LSB468, LSB483  
**Assumed knowledge:** LQB383 is recommended prior study  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

**LQB581 FUNCTIONAL BIOCHEMISTRY**  
This unit will study advanced biochemical concepts with a focus on metabolism, signalling pathways, systems and networks that coordinate and regulate the functional behaviour of cells and tissues.  

**Prerequisites:** (LQB381 or LSB308) and (LQB383 or LSB338)  
**Antirequisites:** LSB508  
**Credit points:** 12  
**Contact hours:** 5 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**LQB582 BIOMEDICAL RESEARCH TECHNOLOGIES**  
This unit will study the technical principles and practical techniques that are essential for advancing research and development in biochemistry and biotechnology.  

**Prerequisites:** LQB381 or LSB308  
**Antirequisites:** LSB527  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**LQB681 BIOCHEMICAL RESEARCH SKILLS**  
In the real world, the design and completion of successful research and/or business projects demand that individuals gather information, solve problems, work effectively as a part of a team and analyse and communicate results in a critical manner. This unit offers opportunities for you to develop these skills that are valued highly by potential employers and research project leaders. The aim of this unit is to assist you to demonstrate and strengthen a number of generic research skills in a mentored problem-based learning environment that mirrors a real-world research team and the challenges that they face.  

**Prerequisites:** LQB381 or LSB308. Students with equivalent study can apply for a requisite waiver  
**Equivalents:** LSB607  
**Credit points:** 12  
**Contact hours:** 5 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

**LQB682 PROTEIN BIOCHEMISTRY AND BIOENGINEERING**  
This unit is designed to give you the essential concepts and techniques driving research and industrial biotechnology so that you will be equipped for multiple careers in the biological sciences. The skills you develop will allow you to enter a practical laboratory environment or to apply your knowledge in related areas of evaluations of technologies and intellectual property.  

**Prerequisites:** LQB381 or LSB308 or LSB325 or (LSN101 and LSN102)  
**Antirequisites:** LSB605, LSB608

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Credit points: 12  
Contact hours: 4 per week  
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  
Contact hours: 4 per week  
Campus: Gardens Point  

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

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.
SCB122 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. SCB122 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-1 and 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