Bachelor of Applied Science/Bachelor of Mathematics (SC20)

Year offered: 2010
Admissions: Yes
CRICOS code: 049434C
Course duration (full-time): 4 years
Domestic fees (indicative): 2010: CSP $2,150 (indicative) per semester
International Fees (indicative): 2010: $11,500 (indicative) per semester
Domestic Entry: February
International Entry: February and July
QTAC code: 418712
Past rank cut-off: 81
Past OP cut-off: 10
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: 384
Standard credit points per full-time semester: 48
Course coordinator: Dr Perry Hartfield (Science); Professor Graeme Pettet (Mathematics)
Campus: Gardens Point

Recommended Study
Maths C and knowledge of at least one of the sciences. For the majors in biochemistry, biotechnology, forensic science, and microbiology - Biological Science and Chemistry are recommended.

Career Opportunities
This four-year double degree provides students with the opportunity to integrate studies in a science area with mathematics. This combination will lead to enhanced job opportunities for graduates and also provide a very sound background for students proceeding to postgraduate research studies in either a science discipline or mathematics.

Mathematics is vital for much scientific research and it is also becoming increasingly important for employees in many science-based careers to have a good background in mathematics and statistics. There are many jobs advertised where employers are ideally looking for applicants with skills and knowledge in science and mathematics. Some examples are:

- Natural resource management - obtaining an accurate estimate of fish populations and predicting sustainable fishing limits requires complex mathematical and statistical modelling
- Agriculture management - from climate modelling down to the individual paddock level, the interaction between forecast crop yields and prices, crop and harvest scheduling and environmental impacts
- Genetics - including gene sequencing and quantitative genetics
- Chemistry and Biochemistry - operations research (scheduling) and quality management techniques benefit management of a chemical testing laboratory or chemicals business; computational and applied mathematics and scientific computation and visualisation relate to research areas such as drug design using combinatorial chemistry
- Infection and disease control - uses statistics and mathematical modelling
- Bioinformatics - involves analysing and modelling data arising in molecular biology, genome sequencing and gene networks
- Developing new physical measurement and imaging techniques - needs applied and computational mathematics

Course Structure
Mathematics provides a very precise way of describing our world and activities within it. It is used to understand and formulate current knowledge, to develop new products and processes and to assist with predicting changes which may occur under various scenarios. Mathematical techniques are used extensively in conjunction with all areas of science.

Graduates will have well-developed analytical and problem-solving skills and also practical hands-on experience in the science area of their choice. They will have the ability to use mathematical and statistical techniques across a wide range of applications and to communicate effectively with others.

This four year double degree course integrates studies in one of the science majors with studies in mathematics. The science majors available are Biochemistry, Biotechnology, Chemistry, Ecology, Environmental Science, Forensic Science, Geoscience, Microbiology and Physics.

The Mathematics component offers studies in core mathematics, applied mathematics, computational mathematics, discrete mathematics, financial mathematics, mathematical modelling, operations research, statistics,
statistical modelling, scientific computation and data visualisation.

Professional Recognition
Membership of the Australian Mathematical Society, the Statistical Society of Australia Inc and the Australian Society for Operations Research is available. For professional recognition relating to the science majors refer to Bachelor of Applied Science (SC01).

Deferment
QUT allows current Year 12 school leavers to defer their undergraduate admission offer for one year, or for six months if offered mid-year admission, except in courses using specific admission requirements such as questionnaires, folios, auditions, prior study or work experience.

Non-year 12 students may also request to defer their QTAC offer on the basis of demonstrated special circumstances.

Find out more on deferment.

Further Information
For further information about this course please contact:

Science Coordinator
Dr Perry Hartfield
Phone: +61 7 3138 2984
Email: p.hartfield@qut.edu.au
Alternative phone contact: +61 7 3138 2782
Alternative email: enquiry.scitech@qut.edu.au

Mathematics Coordinator
Professor Graeme Pettet
Phone: +61 7 3138 5238
Email: g.pettet@qut.edu.au

Course structure

Students must complete at least (a) 192 credit points (16 twelve credit point units) of Mathematics units and (b) 192 credit points (16 twelve credit point units) of Science units, according to the requirements as follows:

Level 1 Units:

<table>
<thead>
<tr>
<th>Unit Code</th>
<th>Unit Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAB101</td>
<td>Statistical Data Analysis 1</td>
</tr>
<tr>
<td>MAB120</td>
<td>Algebra and Calculus</td>
</tr>
<tr>
<td>MAB121</td>
<td>Calculus and Differential Equations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit Code</th>
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</tr>
</thead>
<tbody>
<tr>
<td>MAB122</td>
<td>Algebra and Analytic Geometry</td>
</tr>
<tr>
<td>MAB210</td>
<td>Statistical Modelling 1</td>
</tr>
<tr>
<td>MAB220</td>
<td>Computational Mathematics 1</td>
</tr>
</tbody>
</table>

NOTE: MAB100 is for students who do not have an exit assessment of at least Sound Achievement in four semesters of both Senior Mathematics B and Senior Mathematics C (or equivalent).

Students must complete the following Level 1 Science Foundation units:

<table>
<thead>
<tr>
<th>Unit Code</th>
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</tr>
</thead>
<tbody>
<tr>
<td>SCB110</td>
<td>Science Concepts and Global Systems</td>
</tr>
<tr>
<td>SCB111</td>
<td>Chemistry 1</td>
</tr>
<tr>
<td>SCB112</td>
<td>Cellular Basis of Life</td>
</tr>
</tbody>
</table>

In addition, students are required to complete any mandatory units - and should complete all recommended units, specified for the science major selected.

Level 2 and 3 Mathematics Units:

At least 120 credit points (10 twelve credit point units) must be taken from Level 2 and Level 3 Mathematics units with at least 48 credit points (4 twelve credit point units) from Level 3 Mathematics units:

Students must complete:

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<tr>
<th>Unit Code</th>
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<tbody>
<tr>
<td>MAB311</td>
<td>Advanced Calculus</td>
</tr>
<tr>
<td>MAB312</td>
<td>Linear Algebra</td>
</tr>
</tbody>
</table>

Level 2 and 3 Science Units:

At least 96 credit points (8 twelve-credit point units) must be taken from Level 2 and Level 3 Science units with at least 48 credit points (4 twelve credit point units) from Level 3 Science units. The science units must meet the advanced level requirements of one of the following majors of the SC01 Bachelor of Applied Science course: Biochemistry; Biotechnology; Chemistry; Ecology; Environmental Science; Forensic Science; Geoscience; Microbiology or Physics.

Science Elective Units:

The Mathematics unit (or units) normally undertaken in the first year of SC01 Bachelor of Applied Science is replaced by a Science elective unit (or units). This Science elective unit can be from any level. The level 2 Mathematics unit in the Physics major is replaced by a level 2 Science elective unit.

Science Units: Biochemistry Major (Mandatory units)

<table>
<thead>
<tr>
<th>Year 1, Semester 1</th>
</tr>
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<tbody>
<tr>
<td>SCB111 Chemistry 1</td>
</tr>
<tr>
<td>Course Code</td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td>SCB112</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>SCB120</td>
</tr>
<tr>
<td>SCB121</td>
</tr>
</tbody>
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**Year 1, Semester 2**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Mathematics Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCB120</td>
<td>Plant and Animal Physiology</td>
<td>TWO</td>
</tr>
<tr>
<td>SCB121</td>
<td>Chemistry 2</td>
<td>TWO</td>
</tr>
<tr>
<td>SCB122</td>
<td>Cell and Molecular Biology</td>
<td></td>
</tr>
<tr>
<td>SCB123</td>
<td>Physical Science Applications</td>
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**Year 2, Semester 1**

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<tr>
<td>LQB381</td>
<td>Biochemistry: Structure and Function</td>
<td></td>
</tr>
<tr>
<td>LQB383</td>
<td>Molecular and Cellular Regulation</td>
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**Year 3, Semester 2**

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<tr>
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<tr>
<td>LQB481</td>
<td>Biochemical Pathways and Metabolism</td>
<td></td>
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<td>LQB483</td>
<td>Molecular Biology Techniques</td>
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<td>LQB581</td>
<td>Functional Biochemistry</td>
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</tr>
<tr>
<td>LQB582</td>
<td>Biomedical Research Technologies</td>
<td></td>
</tr>
</tbody>
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**Year 4, Semester 1**

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<tbody>
<tr>
<td>LQB681</td>
<td>Biochemical Research Skills</td>
<td></td>
</tr>
<tr>
<td>LQB682</td>
<td>Protein Biochemistry and Bioengineering</td>
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**Science Units: Biotechnology Major (Mandatory units)**

**Year 1, Semester 1**

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**Year 1, Semester 2**

**Science Units: Chemistry Major (Mandatory units)**

**Year 1, Semester 1**

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<td></td>
</tr>
</tbody>
</table>

Page 3/24
Year 2, Semester 1
SCB110 Science Concepts and Global Systems
Science Elective unit
TWO Mathematics units

Year 2, Semester 2
SCB110 Science Concepts and Global Systems
Science Elective unit
TWO Mathematics units

Year 3, Semester 1
PQB312 Analytical Chemistry For Scientists and Technologists
PQB331 Structure and Bonding
TWO Mathematics units

Year 3, Semester 2
PQB401 Reaction Kinetics, Thermodynamics and Mechanisms
PQB442 Chemical Spectroscopy
TWO Mathematics units

Year 4, Semester 1
PQB502 Advanced Physical Chemistry
PQB531 Organic Mechanisms and Synthesis
TWO Mathematics units

Year 4, Semester 2
PQB631 Advanced Inorganic Chemistry
PQB642 Chemical Research
TWO Mathematics units

Science Units: Ecology Major (Mandatory units)

Year 1, Semester 1
SCB111 Chemistry 1
TWO Mathematics units
SCB112 Cellular Basis of Life

Year 1, Semester 2
SCB120 Plant and Animal Physiology
SCB122 Cell and Molecular Biology
TWO Mathematics units

Year 2, Semester 1
SCB110 Science Concepts and Global Systems
Science Elective unit
TWO Mathematics units

Year 2, Semester 2
NQB201 Planet Earth
NQB202 History of Life on Earth
TWO Mathematics units

Year 3, Semester 1
NQB302 Earth Surface Systems
NQB321 Ecology
TWO Mathematics units

Year 3, Semester 2
NQB421 Experimental Design
NQB422 Genetics and Evolution
TWO Mathematics units

Year 4, Semester 1
NQB521 Population Genetics and Molecular Ecology
NQB523 Population Management
TWO Mathematics units

Year 4, Semester 2
NQB622 Conservation Biology
NQB623 Ecological Systems
TWO Mathematics units

Science Units: Environmental Science Major (Mandatory units)

Year 1, Semester 1
SCB111 Chemistry 1
SCB112 Cellular Basis of Life
TWO Mathematics units

Year 1, Semester 2
SCB120 Plant and Animal Physiology
SCB121 Chemistry 2
TWO Mathematics units

Year 2, Semester 1
SCB110 Science Concepts and Global Systems
### Science Units: Forensic Science Major (Mandatory units)

#### Year 1, Semester 1
- **SCB111**: Chemistry 1
- **SCB112**: Cellular Basis of Life
  - TWO Mathematics units

#### Year 1, Semester 2
- **SCB121**: Chemistry 2
- **SCB122**: Cell and Molecular Biology
  - TWO Mathematics units

#### Year 2, Semester 1
- **SCB110**: Science Concepts and Global Systems
  - Science Elective unit
  - TWO Mathematics units

#### Year 2, Semester 2
- **NQB201**: Planet Earth
- **SCB123**: Physical Science Applications
  - TWO Mathematics units

#### Year 1, Semester 2
- **NQB202**: History of Life on Earth
- **SCB222**: Exploration of the Universe
  - TWO Mathematics units

### Science Units: Geoscience Major (Mandatory units)

#### Year 1, Semester 1
- **SCB111**: Chemistry 1
- **SCB112**: Cellular Basis of Life
  - TWO Mathematics units

#### Year 1, Semester 2
- **NQB201**: Planet Earth
- **SCB123**: Physical Science Applications
  - TWO Mathematics units

#### Year 2, Semester 1
- **SCB110**: Science Concepts and Global Systems
  - Science Elective unit
  - TWO Mathematics units

#### Year 2, Semester 2
- **NQB202**: History of Life on Earth
- **SCB222**: Exploration of the Universe
<table>
<thead>
<tr>
<th>Year 3, Semester 1</th>
<th>NQB311</th>
<th>Mineralogy</th>
<th>TWO Mathematics units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NQB314</td>
<td>Sedimentary Geology</td>
<td>TWO Mathematics units</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3, Semester 2</th>
<th>NQB411</th>
<th>Petrology of Igneous and Metamorphic Rocks</th>
<th>TWO Mathematics units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NQB412</td>
<td>Structural Geology and Field Methods</td>
<td>TWO Mathematics units</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4, Semester 1</th>
<th>NQB502</th>
<th>Field Methods in Natural Resource Sciences</th>
<th>TWO Mathematics units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NQB513</td>
<td>Geophysics</td>
<td>TWO Mathematics units</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4, Semester 2</th>
<th>NQB602</th>
<th>Environmental Chemistry</th>
<th>TWO Mathematics units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NQB612</td>
<td>Basin Analysis and Petroleum Geology</td>
<td>TWO Mathematics units</td>
</tr>
</tbody>
</table>

**Science Units: Microbiology Major (Mandatory units)**

<table>
<thead>
<tr>
<th>Year 1, Semester 1</th>
<th>SCB111</th>
<th>Chemistry 1</th>
<th>TWO Mathematics units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SCB112</td>
<td>Cellular Basis of Life</td>
<td>TWO Mathematics units</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2, Semester 1</th>
<th>SCB120</th>
<th>Plant and Animal Physiology</th>
<th>TWO Mathematics units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SCB121</td>
<td>Chemistry 2</td>
<td>TWO Mathematics units</td>
</tr>
</tbody>
</table>

| Year 2, Semester 2 | SCB110 | Science Concepts and Global Systems | Science Elective unit | TWO Mathematics units |
|--------------------|--------|-----------------------------------|-----------------------|

| Year 3, Semester 1 | LQB386 | Microbial Structure and Function | TWO Mathematics units |

<table>
<thead>
<tr>
<th>Year 3, Semester 2</th>
<th>LQB483</th>
<th>Molecular Biology Techniques</th>
<th>TWO Mathematics units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LQB486</td>
<td>Clinical Microbiology 1</td>
<td>TWO Mathematics units</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4, Semester 1</th>
<th>LQB586</th>
<th>Clinical Microbiology 2</th>
<th>TWO Mathematics units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LQB587</td>
<td>Applied Microbiology 1: Water, Air and Soil</td>
<td>TWO Mathematics units</td>
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</tbody>
</table>

**Science Units: Physics Major (Mandatory units)**

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<tr>
<th>Year 1, Semester 1</th>
<th>SCB110</th>
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<td>SCB111</td>
<td>Chemistry 1</td>
<td>TWO Mathematics units</td>
</tr>
</tbody>
</table>

| Year 1, Semester 2 | PQB250 | Mechanics and Electromagnetism | Science Elective unit | TWO Mathematics units |
|--------------------|--------|---------------------------------|-----------------------|

| Year 2, Semester 2 | PQB251 | Waves and Optics | Science Elective unit | TWO Mathematics units |
|--------------------|--------|-----------------|-----------------------|

<table>
<thead>
<tr>
<th>Year 2, Semester 1</th>
<th>SCB122</th>
<th>Cell and Molecular Biology</th>
<th>TWO Mathematics units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SCB123</td>
<td>Physical Science Applications</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Year 3, Semester 1</th>
<th>LQB381</th>
<th>Biochemistry: Structure and Function</th>
<th>TWO Mathematics units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 3, Semester 2</td>
<td>LQB386</td>
<td>Microbial Structure and Function</td>
<td>TWO Mathematics units</td>
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<td>LQB587</td>
<td>Applied Microbiology 1: Water, Air and Soil</td>
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<table>
<thead>
<tr>
<th>Year 4, Semester 1</th>
<th>LQB686</th>
<th>Microbial Technology and Immunology</th>
<th>TWO Mathematics units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LQB687</td>
<td>Applied Microbiology 2: Food and Quality Assurance</td>
<td>TWO Mathematics units</td>
</tr>
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</table>

**Science Units: Geology Major (Mandatory units)**

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<td>LQB587</td>
<td>Applied Microbiology 1: Water, Air and Soil</td>
<td>TWO Mathematics units</td>
</tr>
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<th>Microbial Technology and Immunology</th>
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<td>Applied Microbiology 2: Food and Quality Assurance</td>
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</tbody>
</table>
PQB450 Energy, Fields and Radiation
PQB451 Electronics and Instrumentation
TWO Mathematics units

Year 4, Semester 1
PQB550 Quantum and Condensed Matter Physics
PQB551 Physical Analytical Techniques
TWO Mathematics units

Year 4, Semester 2
PQB650 Advanced Theoretical Physics
PQB651 Experimental Physics
TWO Mathematics units

Mathematics Component (Mandatory units) (WITH Maths C)

For Students with at least Sound Achievement in both Senior Mathematics B and C

Year 1, Semester 1
MAB101 Statistical Data Analysis 1
MAB121 Calculus and Differential Equations
Plus TWO units selected according to the Science major requirements

Year 1, Semester 2
MAB122 Algebra and Analytic Geometry
MAB210 Statistical Modelling 1
Plus TWO units selected according to the Science major requirements

Year 2, Semester 1
MAB220 Computational Mathematics 1
MAB311 Advanced Calculus
Plus TWO units selected according to the Science major requirements

Year 2, Semester 2
TWO Mathematics unit
Plus TWO units selected according to the Science major requirements

Year 3, Semester 1
MAB312 Linear Algebra
ONE Mathematics unit
Plus TWO units selected according to the Science major requirements

Year 3, Semester 2
TWO Mathematics units
Plus TWO units selected according to the Science major requirements

Year 4, Semester 1
TWO Level 3 Mathematics units
Plus TWO units selected according to the Science major requirements

Year 4, Semester 2
TWO Level 3 Mathematics units
Plus TWO units selected according to the Science major requirements

Mathematics Component (Mandatory units) (WITHOUT Maths C)

For Students with Sound Achievement or Better in Senior Mathematics B Only

Year 1, Semester 1
MAB101 Statistical Data Analysis 1
MAB120 Algebra and Calculus
Plus TWO unit selected according to the Science major

Year 1, Semester 2
MAB121 Calculus and Differential Equations
MAB122 Algebra and Analytic Geometry
Plus TWO unit selected according to the Science major

Year 2, Semester 1
MAB220 Computational Mathematics 1
MAB311 Advanced Calculus
Plus TWO units selected according to the Science major

Year 2, Semester 2
MAB210 Statistical Modelling 1
ONE Mathematics unit
Plus TWO unit selected according to the Science major

Year 3, Semester 1
MAB312 Linear Algebra
ONE Mathematics unit
Plus TWO units selected according to the
Science major

Year 3, Semester 2
TWO Mathematics units
Plus TWO units selected according to the Science major

Year 4, Semester 1
TWO Level 3 Mathematics units
Plus TWO units selected according to the Science major

Year 4, Semester 2
TWO Level 3 Mathematics units
Plus TWO units selected according to the Science major

Mathematics Units

Level 1
MAB101  Statistical Data Analysis 1
MAB120  Algebra and Calculus
MAB121  Calculus and Differential Equations
MAB122  Algebra and Analytic Geometry
MAB210  Statistical Modelling 1
MAB220  Computational Mathematics 1

Level 2
MAB311  Advanced Calculus
MAB312  Linear Algebra
MAB313  Mathematics of Finance
MAB314  Statistical Modelling 2
MAB315  Operations Research 2
MAB413  Differential Equations
MAB414  Applied Statistics 2
MAB420  Computational Mathematics 2
MAB422  Mathematical Modelling
MAB461  Discrete Mathematics
MAB480  Introduction to Scientific Computation
MAB481  Visualisation and Data Analysis

Level 3
You must complete at least four units from:
MAB521  Applied Mathematics 3
MAB522  Computational Mathematics 3
MAB524  Statistical Inference

MAB525  Operations Research 3A
MAB533  Statistical Techniques
MAB536  Time Series Techniques
MAB613  Partial Differential Equations
MAB623  Financial Mathematics
MAB624  Applied Statistics 3
MAB625  Operations Research 3B
MAB640  Industry Project
MAB672  Advanced Mathematical Modelling
MAB681  Advanced Visualisation and Data Analysis

Science Elective Units

The number of elective units will depend upon the major selected. These elective units can be selected from Faculty of Science and Technology units - make sure you meet any prerequisites and don't take an incompatible unit. Some majors include alternative units and you could select an additional unit(s) from these.

Information on some possible Science elective units.
NQB201  Planet Earth
NQB202  History of Life on Earth
SCB120  Plant and Animal Physiology
SCB121  Chemistry 2
SCB122  Cell and Molecular Biology
SCB123  Physical Science Applications
SCB131  Experimental Chemistry
SCB222  Exploration of the Universe
NOTE: Other elective units may be found in the co-majors listed in the SC01 Course Summary Sheet.

Level 2 or 3 Elective Unit Suggestions for Physics Major
PQB360  Global Energy Balance and Climate Change
PQB460  Astrophysics 1
PQB660  Astrophysics 2

Potential Careers:
Actuary, Analytical Chemist, Astrophysicist, Biochemist, Bioinformatician, Biologist, Biotechnologist, Chemist, Chemist Industrial, Coastal Scientist, Conservation Biologist, Database Manager, Ecologist, Environmental Scientist, Forensic Scientist, Geologist, Geophysicist, Geoscientist, Health Physicist, Hydrogeologist, Immunologist, Industrial Chemist, Laboratory Technician (Chemistry), Marine Scientist, Mathematician, Medical

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UNIT SYNOPSES

JSB979 FORENSIC SCIENTIFIC EVIDENCE
The word ‘forensic’ once meant anything relating to a law court. However today the term ‘forensic science’ refers to a whole new subject: it means using science to solve legal issues. As science, and the many sub-disciplines of science, are appearing in court with ever-increasing rapidity, there is a clear need for scientists to understand the foundations of the law, the ways in which law reasons, the adversarial process, and the basics to the key area of evidence law. The aim of this unit is first to provide you with an understanding of evidence law, with a particular emphasis upon the foundations to reception of scientific evidence, and the ways in which expert scientific witnesses are received in our courts. The unit aims to clarify the links between science and law, as well as to articulate the differences between these two increasingly inter-twined disciplines.

Equivalents: JSB937, JSB444  Credit points: 12
Contact hours: 3  Campus: Gardens Point and External Teaching period: 2010 SEM-2

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

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: 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 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: 2010 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  Antirequisites: LSB275, LSB325, LSB408  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2010 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, LSN468, LSN483  Assumed knowledge: LQB383 is recommended prior study  Credit points: 12
**LQB484 INTRODUCTION TO GENOMICS AND BIOINFORMATICS**
The completion of the Human Genome project, along with similar projects on other organisms of a prokaryote and eukaryote nature, marked the beginning of a major revolution in fundamental biology that changed our understanding of the natural world. To understand how information on genome structure-function relationships (ie bioinformatics) is being used in areas such as gene discovery, disease diagnosis and drug development, students need to understand how the information content of DNA and proteins is extracted and analysed. This unit introduces students to the approaches to database mining and genome exploration.

**Prerequisites:** LQB383 or LSB338 or LSN101 and LSN102

**Antirequisites:** LSB537, LSB619, LSB469

**Credit points:** 12  
**Contact hours:** 4 per week

Gardens Point  
**Teaching period:** 2010 SEM-2

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**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

Gardens Point  
**Teaching period:** 2010 SEM-2

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**LQB583 GENETIC RESEARCH TECHNOLOGY**
The tools available for the discovery and manipulation of new genes are increasing exponentially and, in turn, this is having a significant impact in many areas of the life sciences. The true potential for this ultimately relies on the ability to link genes and their function. There are many strategies, both targeted and global, which facilitate an understanding of gene and genome structure function relationships. These strategies rely on integrated technologies based on molecular genetics, molecular biology and genetic engineering. The identification of function leads then to unlimited potential for detection and manipulation of these genes in human, animal and plant systems.

**Prerequisites:** LQB483

**Credit points:** 12  
**Contact hours:** 4 per week

Gardens Point  
**Teaching period:** 2010 SEM-1

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**LQB584 MEDICAL CELL BIOLOGY**
This unit builds and extends the understanding of basic theoretical and practical aspects of molecular cell biology developed in previous cell and molecular biology units. Medical Cell Biology develops and extends the context of the cellular environment and its central role within the organism providing all of the biological functions required by the organism to survive, defend and protect itself from disease and trauma. An understanding of cell biology theory and molecular mechanisms of animal development and disease is essential for introduction to higher level units in medical biotechnology.

**Prerequisites:** LQB383 or LSB338

**Antirequisites:** LSB449, LSB503, LSN584

**Credit points:** 12  
**Contact hours:** 4 per week

Gardens Point  
**Teaching period:** 2010 SEM-1

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**LQB585 PLANT GENETIC MANIPULATION**
The potential of plant biotechnology can only be recognised as a result of the significant advances being made in technologies enabling the genetic manipulation of plants. Familiarity with the strategies, techniques and breadth of applications is essential as a basis for anyone planning a career in plant biotechnology. The unit is designed with a significant emphasis on achieving technical expertise in plant genetic manipulation and control of gene expression.

**Credit points:** 12  
**Contact hours:** 4 per week

Gardens Point  
**Teaching period:** 2010 SEM-1

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**LQB586 CLINICAL MICROBIOLOGY 2**
TBA

**Credit points:** 12  
**Contact hours:** 4 per week

Gardens Point  
**Teaching period:** 2010 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
Equivalents: LSB528 Credit points: 12 Contact hours: 4 per week Campus: Gardens Point Teaching period: 2010 SEM-1

LQB680 FORENSIC DNA PROFILING

The unit covers the evolution of DNA typing from restriction fragment length polymorphism (RFLP) DNA “fingerprinting” to short tandem repeat (STR) analysis using multiplex PCR-based systems for human identification, the principles of single nucleotide polymorphism (SNP) technology, mitochondrial DNA analysis and future trends for forensic DNA analysis.

Prerequisites: SCB384 Credit points: 12 Contact hours: 4 per week Campus: Gardens Point Teaching period: 2010 SEM-2

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. This unit is a capstone biochemistry unit designed to prepare you as a prospective graduate for independent and group research.

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: 2010 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 LSN101 and LSN102
Antirequisites: LSB605, LSB608 Credit points: 12 Contact hours: 5 per week Campus: Gardens Point Teaching period: 2010 SEM-2

LQB684 MEDICAL BIOTECHNOLOGY

In this unit students gain a thorough understanding of diagnostics and therapeutics in the commercial environment of medical biotechnology. LQB6849 aims to increase the student’s understanding of cell-based strategies, approaches and applications used as therapeutic interventions in medicine. The unit focuses on current, state-of-the-art and emerging technologies and applications within biotechnology as directed to novel therapeutic discovery, design, development and delivery of clinical therapeutics including tissue transplantation and regeneration, cellular therapies, genetic therapies, immunotherapies, clinical, ethical and regulatory affairs.

Prerequisites: LQB584 or LSB503 or LSB449
Antirequisites: LSN684 Assumed knowledge: A background understanding of Cell and Molecular Biology as provided in LQB383, LQB483 and LQB584 is assumed knowledge
Equivalents: LSB609 Credit points: 12 Contact hours: 5 per week Campus: Gardens Point Teaching period: 2010 SEM-2

LQB685 PLANT MICROBE INTERACTIONS

Microorganisms, including viruses, bacteria and fungi, cause many devastating diseases in plants and are responsible for significant losses to crops in Australia and Internationally. Diagnosis and control of these organisms, which vary considerably in their biology and infection strategies, is an ongoing challenge. However, plant genetic engineering approaches are now offering new and novel solutions to these problems. These approaches are of widespread scientific, commercial and humanitarian interest. The application of current technologies and development of new, novel technologies relies on an understanding of the biology of the organism, of the way in which these organisms cause disease in plants and the mechanism by which many plants are resistant.

Prerequisites: LQB483 or LSN483 and LSN101 and LSN102 Antirequisites: LSB578 Assumed knowledge: LQB386 recommended Credit points: 12 Contact hours: 4 per week Campus: Gardens Point Teaching period: 2010 SEM-2

LQB686 MICROBIAL TECHNOLOGY AND IMMUNOLOGY

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

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.

Prerequisites: 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

MAB120 ALGEBRA AND CALCULUS

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

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

Equivalents: MAB100, MAB125, MAB180

Credit points: 12

Contact hours: 4 per week

Campus: Gardens Point

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

MAB121 CALCULUS AND DIFFERENTIAL EQUATIONS

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

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

Equivalents: MAB111, MAB126

Credit points: 12

Contact hours: 4 per week

Campus: Gardens Point

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

MAB122 ALGEBRA AND ANALYTIC GEOMETRY

This unit extends your knowledge in the areas of functions, calculus, matrices and vectors introduced in MAB120 by introducing functions of more than one variable, partial derivatives and multiple integrals, vector valued functions, and matrix methods for the solution of large systems of linear equations.

Equivalents: MAB112, MAB127, MAB132

Credit points: 12

Contact hours: 4 per week

Campus: Gardens Point

Teaching period: 2010 SUM-1, 2010 SEM-2 and 2010 SUM
Assumed knowledge: Grade of Sound Achievement in Senior Mathematics C (or equivalent) or MAB120 is assumed knowledge. Students are advised to enrol in either MAB121 or MAB122 in the same semester if not previously completed. **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2010 SEM-2

MAB220 COMPUTATIONAL MATHEMATICS 1
This unit includes: sources of error; computer arithmetic; solution of nonlinear equations in one variable; solution of systems of linear equations; interpolation; finite differences; numerical differentiation and integration; solution of first order linear differential equations; MATLAB programming. Students without an exit level of Sound Achievement in four semesters of Senior Mathematics C need to be concurrently enrolled in MAB100 if not completed earlier.

**Assumed knowledge:** Grade of at least Sound Achievement in Senior Mathematics B (or equivalent) or MAB105 and corequisite MAB120 or MAB125 or MAB100 or MAB180 if you don't have Senior Mathematics C is assumed knowledge. **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2010 SEM-1 and 2010 SEM-2

MAB311 ADVANCED CALCULUS
This unit includes the following: polar coordinates; parametric equations; conic sections; quadric surfaces; vector-valued functions; Fourier series; functions of several variables; graphs; partial derivatives; total derivatives; extrema; Lagrange multipliers; Taylor series for multivariable functions; double and triple integrals; Green's theorems; line and surface integrals; divergence theorem; Stoke's theorem; applications.

**Prerequisites:** (MAB111 or MAB121) and (MAB112 or MAB122)  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2010 SEM-1

MAB312 LINEAR ALGEBRA
This unit covers the following broad topics from linear algebra: matrix analysis; eigenvalues and eigenvectors; vector spaces; inner product spaces.

**Prerequisites:** (MAB111 or MAB121) and (MAB112 or MAB122)  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2010 SEM-1

MAB313 MATHEMATICS OF FINANCE
This unit includes: interest rates; solution of problems in compound interest; applications of annuities; valuation of securities; quantitative techniques in business and finance. Students need to concurrently enrol in MAB111 unless already completed.

**Prerequisites:** MAB111 or MAB121  **Antirequisites:** MAN313  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2010 SEM-2

MAB314 STATISTICAL MODELLING 2
This unit includes: models for stochastic processes and statistical methods, which have applications in engineering, information technology, finance, and physical and life sciences. Markov chains; random walks; branching processes; queueing processes; long-term behaviour of processes; use of generating functions; bivariate and conditional distributions; transformations of random variables; beta and gamma distributions; mixture distributions; order statistics, minimum and maximum.

**Prerequisites:** MAB112 and MAB210  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2010 SEM-1

MAB315 OPERATIONS RESEARCH 2
This unit introduces the essential features of operations research methods. It develops a number of basic mathematical techniques to solve generic problems and the theoretical foundations of these techniques. Students should develop the ability to apply various operations research methods, algorithms and techniques in the solution of practical problems. Students will also look at the applications of operations research techniques to real-world problems.

**Prerequisites:** MAB210 and (MAB112 or MAB122)  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2010 SEM-1

MAB413 DIFFERENTIAL EQUATIONS
This unit includes: linear and nonlinear differential equations; series methods; Laplace transform; transforms of derivatives and integrals; systems of differential equations; basic theory on linear systems; solution of linear systems with constant coefficients; matrix methods; phase plane analysis.

**Prerequisites:** MAB311 or MAB312  **Antirequisites:** MAN413  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2010 SEM-2

MAB414 APPLIED STATISTICS 2
This unit includes: Simple linear regression (revision), multiple linear regression, making inferences from regressions, choosing a model, checking model assumptions, general linear models - analysis of covariance, ANOVA revisited, designing experiments, issues in designing experiments, analysing experimental results, further experimental designs, assumptions, and how to cope if they aren't met, simulations.

**Prerequisites:** MAB101 and MAB111  **Assumed knowledge:** MAB112 is recommended prior study  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2010 SEM-2
MAB420 COMPUTATIONAL MATHEMATICS 2
This unit includes: direct methods for systems of linear equations; solution methods for special matrix systems (banded matrix systems, block-banded matrix systems, data structures and algorithms for storing and manipulating sparse matrices, reordering schemes); vector and matrix norms (basic theory and definitions, error bounds for direct methods, condition numbers); iterative methods for systems of linear equations (Jacobi, Gauss-Siedel, Successive Over-Relaxation, conjugate gradient); iterative methods for the eigenvalue problem.
Prerequisites: MAB220 and MAB312    Credit points: 12
Contact hours: 4 per week    Campus: Gardens Point
Teaching period: 2010 SEM-2

MAB422 MATHEMATICAL MODELLING
This unit includes models developed with the "real world" description. These models are taken from the areas of cancer research, population growth and engineering. Emphasis is on mathematical modelling and not on the development of new mathematical content.
Prerequisites: MAB121    Antirequisites: MAN422
Assumed knowledge: MAB220 is recommended for prior/concurrent study for exposure to MATLAB
Credit points: 12    Contact hours: 4 per week    Campus: Gardens Point
Teaching period: 2010 SEM-2

MAB461 DISCRETE MATHEMATICS
This unit has three basic components. They are combinatorics, abstract algebra and number theory. Combinatorics, which is about 60% of the unit, will largely consist of enumeration techniques in variopis settings. Abstract algebra (~20%) will advance the student’s knowledge of groups, rings and fields to include additive groups, multiplicative groups; polynomial rings, finite fields, isomorphisms, and homomorphisms. Number theory (~20%) will include methods of proof including induction and contradiction, modular arithmetic and congruence, gcd/lcm and theorems involving these, fundamental theorem of arithmetic, Fermat’s theorems, Euler’s theorem.
Prerequisites: MAB112 or MAB122    Credit points: 12
Contact hours: 4 per week    Campus: Gardens Point
Teaching period: 2010 SEM-2

MAB480 INTRODUCTION TO SCIENTIFIC COMPUTATION
This unit teaches students how to implement a mathematical algorithm in a modern scientific computing environment (eg Matlab). A case-study approach is used with an emphasis on writing efficient code. Also an overview of other software packages used in mathematics will be given.
Prerequisite(s): MAB112 or MAB132 or MAB182 (Recommended: MAB210 or MAB220)    Credit points: 12
Contact hours: 4 per week    Campus: Gardens Point
Teaching period: 2009 SEM-2    Incompatible with: MAB380, ITB849

MAB481 VISUALISATION AND DATA ANALYSIS
This unit covers; history and evolution of data visualisation, definition of data visualisation, impact of data visualisation; fundamentals of computer graphics and modern day visualisation environments; visualisation of 2-D and 3-D data; general visualisation techniques including filtering; colour map transformations; contouring; height fields; coloured height fields; interpolation; Delauney triangulation; iso-surfaces; volume visualisation; probing; slicing; streamlines; streaklines and texture mapping; visualisation of multi-dimensional data; other data types such as finite element, vector, molecular and scatter data. Not offered after 2009.
Prerequisite(s): MAB101, MAB111, MAB480 or ITB003 (Highly Recommended: MAB112)    Credit points: 12
Contact hours: 4 per week    Campus: Gardens Point
Teaching period: 2009 SEM-1

MAB521 APPLIED MATHEMATICS 3
This unit includes: partial differential equations such as the wave, heat and Laplace equations; special functions(gamma, delta, Bessel and error functions, Legendre polynomials); vector analysis and applications (vector algebra, vector calculus, fields, grad, div, curl, line and surface integrals, divergence theorem, Stoke’s theorem, applications); functions of a complex variable (analytic functions, contour integrals, Laurent series, residues).
Prerequisites: MAB311    Credit points: 12
Contact hours: 4 per week    Campus: Gardens Point
Teaching period: 2010 SEM-1

MAB522 COMPUTATIONAL MATHEMATICS 3
This unit includes: deriving the basic equations that describe fluid motion; the finite volume method for solving PDEs (application to the generalised diffusion equation, cell-centred and vertex-centred schemes, handling of boundary and initial conditions); solution of systems of nonlinear equations (Newton's method, Inexact Newton methods, globally convergent methods).
Prerequisites: MAB311 and MAB420    Credit points: 12
Contact hours: 4 per week    Campus: Gardens Point
Teaching period: 2010 SEM-1

MAB524 STATISTICAL INFERENCE
This unit includes: maximum likelihood estimation, confidence intervals and hypothesis tests, introduction to Bayesian inference, prior and posterior distributions, Bayesian inference for binomial data, Poisson count data and normal data, simulation techniques for sampling from distributions. Use of software Matlab and R.
Prerequisites: MAB314    Credit points: 12
MAB525 OPERATIONS RESEARCH 3A
This unit develops problem-solving skills and sharpens analytical skills. This unit introduces the technical issues involved in applying operations research principles, methods and algorithms in the solution of real-world problems.
Prerequisites: MAB315  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2010 SEM-1

MAB533 STATISTICAL TECHNIQUES
This unit builds on your knowledge and skills of statistical techniques and aims to provide you with an understanding and a working knowledge of some more specialised statistical techniques and their applications. Topics covered include quality management concepts and tools for statistical process control, modelling and analysis of reliability (for inanimate objects) and survival (for living entities), and multivariate techniques such as principal components analysis, discriminant analysis and cluster analysis.
Prerequisites: MAB210 and MAB414  Antirequisites: MAB523  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2010 SEM-1

MAB536 TIME SERIES ANALYSIS
This unit includes the following: fundamentals of time series analysis; time series models; nonstationary processes; seasonal ARIMA models; vector autoregression; long-range dependence and fractional ARIMA models; co-integration of nonstationary processes.
Prerequisites: MAB314 and MAB414  Antirequisites: MAB672  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2010 SEM-2

MAB613 PARTIAL DIFFERENTIAL EQUATIONS
This unit includes the following: derivation of certain partial differential equations; solution of partial differential equations by separation of variables, Laplace and Fourier transforms; Sturm-Liouville systems; special functions; Green's functions.
Prerequisites: MAB311 and MAB413  Antirequisites: MAB626  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2010 SEM-2

MAB623 FINANCIAL MATHEMATICS
This unit includes the following: quantitative techniques in business, economics and finance; theory and structure of interest rates; general accumulation and discounting functions; force of interest; discounting including Modern Portfolio theory and extension; varying interest; general annuities; varying annuities; continuous varying annuities; mathematical analysis of financial transactions in money and capital markets; life annuities and life assurances; the life table; basic life table functions; life annuities and assurances; policy values; paid up policy values; changes to policies; use of life table; superannuation.
Prerequisites: MAB313 and MAB311  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2010 SEM-2

MAB624 APPLIED STATISTICS 3
This unit includes the following: design of experiments for factorial investigations (two and three-level factors, Taguchi's approach, fractions and blocking, response surfaces); general linear model; regression graphics; multi-stratum designs and analysis; repeated measures designs and analysis; linear-logistic and log-linear models; use of statistical software.
Prerequisites: MAB414  Antirequisites: MAN624  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2010 SEM-2

MAB625 OPERATIONS RESEARCH 3B
This unit includes phases of an operations research study; decision analysis; queuing theory; simulation; implementation in operations research; heuristic techniques.
Prerequisites: MAB315  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2010 SEM-2

MAB640 INDUSTRY PROJECT
For this unit, you will usually work in industry part-time. You will be assisted to develop a suitable plan to manage the project. You are expected to record progress and subsequently develop an accurate report.
Other requisites: Unit coordinator approval is required to enrol  Credit points: 24  Campus: Gardens Point  Teaching period: 2010 SEM-1 and 2010 SEM-2

MAB672 ADVANCED MATHEMATICAL MODELLING
Models are developed beginning with the description of 'real world' problems. Emphasis is on the mathematical modelling and not on the development of new mathematical techniques. The unit includes: mathematical modelling; model formulation; dimensional analysis and re-scaling; curves of pursuit; bungy jumping; modelling with systems of ordinary differential equations; phase plane methods for analysing systems of ODEs; bacterial growth in a chemostat; predator-prey models with harvesting; limit cycles; oscillations and excitable media; modelling with partial differential equations; motion of a continuum; continuity; traffic flow; aggregation of slime mould amoebae; momentum; ideal gas dynamics; quasi-linear PDEs.
Prerequisites: MAB422 and MAB312  Antirequisites: MAN672  Credit points: 12  Contact hours: 4 per week
MAB681 ADVANCED VISUALISATION AND DATA ANALYSIS
This unit includes: advanced visualisation; virtual reality and data analysis; contemporary issues in data visualisation; introduction to advanced tools; completion of a project in advanced visualisation which demonstrates analysis, background research, investigation, development of project proposal, and presentation of the project outcomes.
Prerequisite(s): MAB481 (Highly Recommended: MAB380 or MAB480) Contact hours: 4 per week Campus: Gardens Point Teaching period: 2007 SEM-2 Incompatible with: MAN681

NQB201 PLANET EARTH
Earth Science impacts every aspect of modern life. Hence, the concepts of Earth Science are fundamental not only to the field of Geology, but also to Environmental Science, natural resource management, civil engineering and society at large. Planet Earth provides an introduction to Earth Science, including earth materials, geologic history, geological process at the Earth's surface, and the complex interplay between the lithosphere, atmosphere, hydrosphere and biosphere through geologic time. Thus, Planet Earth is a foundation unit for further studies in Geology and Environmental Science and also serves as a broad introduction to the world we live on.
Equivalents: NRB230 Credit points: 12 Contact hours: 4 per week Campus: Gardens Point Teaching period: 2010 SEM-2

NQB202 HISTORY OF LIFE ON EARTH
This unit provides an introduction to the history and development of life on Earth with an emphasis on fundamental biological and ecological principles as they have operated through geological time. The unit provides the student with an understanding of the processes of evolution, extinction and the changing environmental conditions through Earth's history. The unit provides the student with practical experience in fossil identification, classification and morphological interpretation. It provides the student with a "deep-time" perspective of climate and other environmental changes affecting modern ecosystems. Hence, History of Life on Earth is a foundation unit for the Earth and Environmental Sciences as well as Ecology, Biological Sciences and Education.
Equivalents: NRB240 Credit points: 12 Contact hours: 4 per week Campus: Gardens Point Teaching period: 2010 SEM-2

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: QB201 is assumed knowledge.
Equivalents: NRB301 Credit points: 12 Contact hours: 4 per week Campus: Gardens Point Teaching period: 2010 SEM-1
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:** 2010 SEM-1

**NQB403 SOILS AND THE ENVIRONMENT**  
Soils are the most dynamic component of Earth surface processes, being the interface of the lithosphere and the atmosphere and a key system within the biosphere and the hydrosphere. It is, therefore, one of the most critical resources to consider within the context of climate change. This unit will provide you with grounding in soil science by emphasising pedological principles, their application to environmental soil analysis and management, and knowledge of ecosystem function of soils in a changing environment. The unit would provide experience in describing and classifying soils and soil materials as well as field experience in the investigation of soil processes and the assessment of resource potential and environmental hazard.

**Prerequisites:** NQB302 or NRB301 or (ENB272 and ENB274)  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

**NQB411 PETROLOGY OF IGNEOUS AND METAMORPHIC ROCKS**  
This unit includes an introduction to the description, classification and origin of igneous and metamorphic rocks and practical development of lithologic and petrographic abilities to identify mineral assemblages, classify rocks, and interpret textures. Field and theoretical constraints on the petrogenesis of rocks are discussed in lecture. Field study is an essential component of the unit. This unit builds upon the knowledge and skills acquired in the prerequisite unit (NQB311 Mineralogy).

**Prerequisites:** NQB311 or NRB333  
**Equivalents:** NRB436  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

**NQB412 STRUCTURAL GEOLOGY AND FIELD METHODS**  
Structural geology, the deformation of earth materials, is one of the main elements in the core curriculum in geology. It is also essential to other subdisciplines of geology, such as foundation engineering and petroleum and mineral exploration. Geologists need to be able to describe and map structures, to understand the mechanical principles of rock deformation, and to be able to manipulate and calculate structural data.

**Prerequisites:** NQB314 or NRB331  
**Equivalents:** NRB434  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

**NQB421 EXPERIMENTAL DESIGN**  
An understanding of experimental design is essential for students and professionals in the ecological and environmental sciences as many biological systems are characterised by high levels of variability. This unit emphasises practical considerations of field and laboratory-based experimentation in ecology and environmental science, and provides experience in problem assessment, definition, formulation of testable hypotheses and experimental design.

**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:** 2010 SEM-2

**NQB422 GENETICS AND EVOLUTION**  
This unit provides a basic understanding of the mechanisms of inheritance using Mendelian Genetics as a foundation. These principles are extended to develop a clear understanding of the mechanisms and processes that drive evolution in natural populations. Topics include the physical basis of heredity, Mendelian and non-Mendelian inheritance patterns, genotype/environment interactions, quantitative traits, evolutionary theory, adaptation and natural selection, speciation and phylogeny, sexual selection and the evolution of life histories.

**Prerequisites:** SCB112  
**Equivalents:** NRB410  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

**NQB501 ENVIRONMENTAL MODELLING**  
The capacity for management of complex environmental problems such as climate change, now and in the future, will rely on the capacity of environmental managers to create, interpret and critically analyse models of environmental systems. Mathematical model building promotes the capacity to understand the interdependent relationships that characterise environmental systems and also provides a quantitative foundation for informed environmental management.

**Prerequisites:** NQB412 or NQB421  
**Assumed knowledge:** 48 credit points of second level science units is assumed knowledge.  
**Equivalents:** NRB500  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-1

**NQB502 FIELD METHODS IN NATURAL RESOURCE SCIENCES**  
Field experience is an essential part of the professional training of geologists, environmental scientists, ecologists, and natural resource specialists in general. The theory and practice of methods to interpret, measure, map, and monitor important natural resource features and characteristics are essential to the study of geological, ecological and
environmental systems. Methods of survey, mapping and interpretation are necessary skills for resource assessment, geo-exploration, environmental impact assessment, land evaluation, baseline studies, and ecological investigations. There are varying emphases on these outcomes depending on the type of field survey you undertake in this unit.

**Prerequisites:** (NQB321 or NQB411) and (NQB302 or NQB412)  
**Assumed knowledge:** 36 credit points of second level science units in selected major is assumed knowledge. NQB302 and NQB403 for Env Sc, NQB321 for Ecol, NQB411 and NQB412 for Geosc  
**Equivalents:** NRB601  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-1

**NQB513 GEOPHYSICS**

Geophysics is an integral branch of geology, providing many of the most useful methods of imaging the subsurface of the earth. These methodologies are useful in disciplines as diverse as plate tectonics, oil and mineral exploration, hydrogeology, environmental geology, engineering geology, and seismic hazards.

**Prerequisites:** (NQB201 or NRB230) and (NQB412 or NRB434)  
**Equivalents:** NRB534  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-1

**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:** 2010 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:** NRB511  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-1

**NQB601 SUSTAINABLE ENVIRONMENTAL MANAGEMENT**

Sustainable environmental management requires a multidisciplinary approach to decision-making. This approach must be founded on scientific knowledge about the environment, but to be effective, the science must also be integrated with social, economic, political and technological policies. This unit explores contemporary environmental management issues: the science behind them, linkages between them, their cultural settings and sustainable solutions.  
**Assumed knowledge:** 48 credit points of second level science units is assumed knowledge.  
**Equivalents:** NRB600  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

**NQB602 ENVIRONMENTAL CHEMISTRY**

This unit includes the following: design and quality control of physicochemical monitoring programs; fundamentals of data analysis; methodologies of monitoring (variables, instruments, sampling strategies including location and frequency of observation, analytical protocols); introduction to biogeochemical cycles; the relationships between molecular structures and environmental properties; hazardous substances in the environment; chemistry of natural water bodies, including solutes and equilibria; chemistry of water pollutants; indicators of water quality: the atmosphere - structure and energy balance; air pollutants.  
**Prerequisites:** PCB140 or PCB142 or SCB111 or SCB121  
**Assumed knowledge:** 72 credit points of Science and/or Health units is assumed knowledge  
**Equivalents:** NRB440  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

**NQB612 BASIN ANALYSIS AND PETROLEUM GEOLOGY**

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

**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 NRB311, and NQB422 or NRB410  
**Equivalents:** NRB611  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

### NQB623 ECOLOGICAL SYSTEMS

This unit integrates the content of other ecology units into applied approaches to the management of populations and systems. The unit employs concepts from population ecology, population management and conservation biology and builds methodologies and concepts necessary for an applied approach to conservation and pest management. A field trip provides the vehicle for developing these themes. Content includes collection, collation and preparation of biological resource material relevant to a case study, diagnostic features and identification of species of relevance, factors involved in the design of a large-scale field study, field techniques necessary for understanding species/habitat interactions, and the analysis and interpretation of large field data sets.

**Prerequisites:** NQB321 or NRB311  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

### PQB250 MECHANICS AND ELECTROMAGNETISM

The experimental means by which we have arrived at our modern understanding of the universe is central to the scientific philosophy. Students of physics and physics related areas need to possess skills in quantitative handling, processing, communication and evaluation of data. Higher level studies in specialised areas of Physics require a familiarity with a range of fundamental topics in Physics and an ability to apply critical thinking and advanced mathematical techniques to the analysis and solution of Physical problems. This first-level unit lays the foundation for these higher level studies by introducing the fundamental topic areas of mechanics and electromagnetism.

**Assumed knowledge:** Senior Maths B is assumed knowledge.  
**Credit points:** 12  
**Contact hours:** 4.5 hours per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

### PQB251 WAVES AND OPTICS

Wave phenomena are used to describe and explain many of the physical processes in the universe. Sound and light are the most commonly experienced of these and have far-reaching human applications, including their use as experimental tools for science. The study of wave phenomena has led to the development of quantum mechanics, a cornerstone of modern scientific thought. This first-level unit lays the foundation for discussion of wave phenomena in higher level studies, but will also be relevant to those not considering progressing to a Physics major but wishing to understand more of the physical world in which we live.

**Assumed knowledge:** Senior Maths B is assumed knowledge.  
**Credit points:** 12  
**Contact hours:** 4.5 hours per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

### PQB312 ANALYTICAL CHEMISTRY FOR SCIENTISTS AND TECHNOLOGISTS

Reliable chemical analysis and testing is fundamental to the functioning of our society. This generic unit is designed for future scientists and technologists in the fields of chemistry, forensic science and other similar sciences. It introduces students to concepts of quality assurance, good laboratory practice and the vital instrumental areas of analysis – chromatography and spectroscopy. Laboratory work is a key extensive activity in this unit.

**Prerequisites:** SCB131  
**Equivalents:** PCB414  
**Credit points:** 12  
**Contact hours:** 4.5 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-1 and 2010 SEM-2

### PQB331 STRUCTURE AND BONDING

This unit provides detailed coverage of the theories of bonding in organic, inorganic and coordination compounds including orbital hybridisation valence bond theory, coordination theory and crystal field theory. The cause and effect relationships between bonding and structure are developed leading to an understanding of structural variability, chirality, and other modes of isomerism for a broad range of chemical compounds. An introduction to molecular symmetry, which is central to the study of molecular geometry and shape, also provides the background for later studies in spectroscopy. Lectures are complemented by 7 laboratory experiments and 4 hands-on style workshops.

**Prerequisites:** SCB121 and SCB131  
**Antirequisites:** PCB334, PCB354  
**Credit points:** 12  
**Contact hours:** 4.5 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-1

### PQB350 THERMODYNAMICS OF SOLIDS AND GASES

This unit provides students with an overview of the basic thermodynamic principles that describe how heat and other forms of energy are transported through matter in its solid and gaseous states. Through integrated lecture and practical classes, it provides students with a foundation for more advanced studies later in areas such as condensed matter physics and quantum mechanics. The three areas of
study in this unit; thermodynamics, solid state physics and statistical physics; are essential core topics if students are considering postgraduate study in the physical sciences or professional employment as a physicist.

Prerequisites: PQB250 or PCB250, and MAB111
Corequisites: MAB311 Assumed knowledge: Students should enrol in MAB311 in the same semester if not already completed
Equivalents: PCB562
Credit points: 12
Contact hours: 4 per week
Campus: Gardens Point
Teaching period: 2010 SEM-2

PQB360 GLOBAL ENERGY BALANCE AND CLIMATE CHANGE
Modern societies are becoming increasingly aware of potential environmental problems associated with conventional energy production technologies. Application of alternative technologies is therefore increasing, with ambitious targets and plans to support research and development for reducing energy related environmental consequences. This unit is designed to offer science and engineering students an opportunity to gain awareness about the expanding field of alternative energy technologies and to understand relationships between use of energy and its impact on local and global environment.

Prerequisites: MAB111 or MAB131 Equivalents: PCB563
Credit points: 12
Contact hours: 4 per week
Campus: Gardens Point
Teaching period: 2010 SEM-1

PQB401 REACTION KINETICS, THERMODYNAMICS AND MECHANISMS
This unit deals with the way in which the fundamental concepts of physical chemistry govern the extent and rates of chemical reactions and applies them to actual reaction types from the fields of organic and inorganic chemistry. Topics include: thermodynamics including enthalpy, heat capacity, entropy, Gibbs free energy, chemical equilibria and an introduction to electrochemistry: chemical kinetics including rate laws, mechanisms of chemical reactions, collision theory of reaction rates and the steady state principle as well as acids and bases in both aqueous and non aqueous environments.

Prerequisites: PQB331
Antirequisites: PCB354, PCB405
Credit points: 12
Contact hours: 4.5 per week
Campus: Gardens Point
Teaching period: 2010 SEM-2

PQB442 CHEMICAL SPECTROSCOPY
Spectroscopic techniques are now widespread in scientific laboratories. An appreciation of both the principles and practice of spectroscopy is essential for those contemplating a career in chemistry. The use of spectroscopic methods to elucidate molecular structure provides an excellent vehicle for training in the scientific method, particularly the logical application of experimental data to deduce the solution to a complex problem. Whilst the fundamental theoretical concepts will be dealt with in the early part of the unit, later emphasis will be on developing practical skills in problem solving, a skill of value to all fields of scientific and technological endeavour.

Prerequisites: PQB331
Equivalents: PCB444
Credit points: 12
Contact hours: 4 per week
Campus: Gardens Point
Teaching period: 2010 SEM-2

PQB450 ENERGY, FIELDS AND RADIATION
The common theme of the topics covered in this unit is fields, the energy contained in these fields and the transfer of this energy. This theme is addressed in the specific topics of classical mechanics, electromagnetism and radiation physics. The classical mechanics and electromagnetism components build on material presented in introductory units and apply this to complex real world problems. The unit is designed to prepare students for more advanced studies in these areas but the unit will also provide a useful background for students undertaking a comajor in Physics or preparing for a career in secondary education.

Prerequisites: PCB250 or PCB250, and MAB311
Equivalents: PCB362
Credit points: 12
Contact hours: 4 per week
Campus: Gardens Point
Teaching period: 2010 SEM-2

PQB451 ELECTRONICS AND INSTRUMENTATION
Instrumentation plays an increasingly important role in the life of a scientist. This unit is designed to give the student a working knowledge in instrumentations and the principles of circuit theory and electronics that underlie instrumentation. It is offered at this stage of the program since it relies on work developed in the earlier advanced-level units and provides a basis for experimental work in later units.

Prerequisites: PCB250 or PCB250
Antirequisites: PCB361, PCB460
Credit points: 12
Contact hours: 4 per week
Campus: Gardens Point
Teaching period: 2010 SEM-2

PQB460 ASTROPHYSICS 1
This second level unit is one of the key units in the astrophysics co-major and introduces students to most of the main aspects of astrophysics. This unit is essential as it defines the connections between the supporting units of the co-major. Students are required to use the knowledge and skills developed in first level physics, maths and natural resource units.

Prerequisites: PCB136 or PCB250 or SCB123
Equivalents: PCB469
Credit points: 12
Contact hours: 4 per week
Campus: Gardens Point
Teaching period: 2010 SEM-2

PQB502 ADVANCED PHYSICAL CHEMISTRY
A Chemistry graduate in today's highly technological world requires knowledge of the principles that govern the behaviour of solids, liquids, gases, and mixtures thereof.
This leads to an appreciation of how fundamental physical chemical principles determine the bulk properties of materials and how the chemical nature of interfaces govern chemical reactions in many important applications. This unit is placed appropriately in fifth semester, following the second year units that provide the basic principles, language and tools of chemistry.

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

**PQB513 INSTRUMENTAL ANALYSIS**  
TBA  
**Prerequisites:** PQB312 or PCB414  
**Equivalents:** PCB514  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-1

**PQB531 ORGANIC MECHANISMS AND SYNTHESIS**  
This unit deals with organic reaction mechanisms and their application in organic synthesis. Topics in mechanisms include: structural and electronic effects that govern reactivity of organic molecules; major classes of mechanisms including elimination reactions, nucleophilic additions to carbonyl compounds, nucleophilic acyl substitution, electrophilic addition to alkenes and electrophilic substitution of aromatics. Topics in synthesis include the principles of organic synthesis design using the retrosynthetic approach; carbon-carbon bond formation to build the major functional group classes; and the use of protecting and activating groups.

**Prerequisites:** PQB401, PQB442  
**Antirequisites:** PCB554  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-1

**PQB550 QUANTUM AND CONDENSED MATTER PHYSICS**  
TBA  
**Prerequisites:** PQB350 and (MAB135 or MAB311)  
**Equivalents:** PCB561  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-1

**PQB551 PHYSICAL ANALYTICAL TECHNIQUES**  
Modern methods of physical analysis are an important tool for the physical scientist. This unit provides an introduction to the physical principles and applications in three fields of analysis: X-ray diffraction, analytical electron microscopy and physical spectroscopy. Each of these topics encompasses a variety of measurement techniques. The methodologies presented have wide application in a number of areas of science and technology including nanotechnology and materials research and development. Lectures are supplemented by laboratory practicals to enable students to gain familiarity and experience with the instrumentation.

**Prerequisites:** (PQB350 or PCB462) and (MAB112 or MAB122)  
**Equivalents:** PCB562  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-1

**PQB584 FORENSIC PHYSICAL EVIDENCE**  
This unit provides a theoretical and practical framework to introduce you to the physical evidence processing techniques of questioned documents and computer forensics and the forensic examination techniques of optical and electron microscopy. The unit will also discuss the physical and chemical structure of some common types of physical evidence (fibres, fabrics & severance, soils and physical fits) and the analytical methods used for their analysis. It is placed appropriately in the fifth semester of the course to coincide with and complement the Instrumental Analysis unit PQB513 which the core knowledge for the instrumental techniques used within the forensic analysis of various types of physical evidence.

**Prerequisites:** PQB312, SCB384  
**Antirequisites:** PCB584  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-1

**PQB631 ADVANCED INORGANIC CHEMISTRY**  
Major topics covered are as follows: organometallic chemistry, including metal-carbon bonding, main group and transition metal organometallics and applications of organometallic compounds in synthetic chemistry; bioinorganic chemistry; physical methods of structure determination, such as single crystal X-ray diffraction; chemical applications of group theory.

**Prerequisites:** PQB331  
**Equivalents:** PCB634  
**Credit points:** 12  
**Contact hours:** 5 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

**PQB642 CHEMICAL RESEARCH**  
This unit addresses a selection of topics in advanced chemistry from a range of evolving areas of relevance in modern chemistry and chemical technology such as nanotechnology, drug design, free-radical chemistry and trace metal speciation in environmental and biological systems. It includes the important issue of the societal and ethical implications of the profession of chemistry.

**Prerequisites:** 4 Advanced Level Chemistry units  
**Assumed knowledge:** Completion of any advanced Chemistry units is assumed knowledge  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

**PQB650 ADVANCED THEORETICAL PHYSICS**  
This unit consists of three parts. Part A extends the content of previous units in electromagnetism and the application of Maxwell's equations, electromagnetic waves, polarisation, dielectric permittivity, transmission line theory, waveguides, optic fibre theory, antennae. Part B includes a detailed study of magnetic resonance and its applications. Part C presents...
the extension of studies in statistical mechanics, including microscopic approach to entropy, partition function, paramagnetism, perfect and real classical and quantum gases, phase equilibria, Bose-Einstein condensate, Brownian motion.

**Prerequisites:** (PQB350 or PCB462) and (PQB550 or PCB561)  
**Equivalents:** PCB665  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

**PQB651 EXPERIMENTAL PHYSICS**
This unit represents the culmination of the students' experiences in undergraduate experimental work. The unit offers the opportunity to select three experiments to be undertaken from a series of extended experiments in the areas of physics research undertaken at QUT.

**Prerequisites:** PQB451 or PCB460  
**Equivalents:** PCB661  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-1 and 2010 SEM-2

**PQB660 ASTROPHYSICS 2**
This unit presents a theoretical background for the general theory of relativity and relativistic cosmology. This includes special theory of relativity, four-vectors and tensors, tensor calculus, covariant differentiation, least action principle and main postulates in special and general relativity, concepts of the interval and space-time metric, gravitation redshift, geodesic equation, energy tensor, Einstein equations for gravitational field, gravitational collapse, Schwarzschild metric, event-horizon for black holes, gravitational waves, cosmological principle, standard cosmological models, Robertson-Walker metric, dark energy, evolution of the universe, Big Bang, cosmological horizons, cosmic background radiation, and cosmological redshift.

**Prerequisites:** PQB450 or PCB362, and MAB311 or MAB521  
**Equivalents:** PCB669  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

**PQB684 FORENSIC ANALYSIS**
This unit provides a theoretical and practical framework for forensic analysis and toxicology. It includes topics such as nature and abuse of drugs; introduction to pharmacology and toxicology; illicit drugs and trace evidence; the application of GC, MS and IR in forensic examination; examination of trace evidence. Substantial laboratory and workshop sessions complement the theory.

**Prerequisites:** PQB513 or PCB514  
**Equivalents:** PCB684  
**Credit points:** 12  
**Contact hours:** 5 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

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

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

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

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

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

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

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

SCB131 EXPERIMENTAL CHEMISTRY
A study of chemistry and related disciplines such as medical science, biochemistry, molecular biology and pharmacy requires the development of practical laboratory skills used in synthesis and chemical analysis. This unit is a laboratory-based unit which is designed for students who intend to continue with experimental science units. The lectures complement the weekly practical sessions and teach the theory required to interpret experimental results.
Prerequisites: SCB111 or SCB113  Corequisites: SCB121 unless SCB113 has been successfully completed  Credit points: 12  Campus: Gardens Point  Teaching period: 2010 SEM-2

SCB222 EXPLORATION OF THE UNIVERSE
This unit provides an introduction to optical observational astronomy; instrumentation; celestial sphere and astronomical coordinates; observations of constellations, stars, planets, clusters and other interesting celestial objects. The theory includes: optics of telescopes; properties of light; determination of physical properties of stars; nebulae; stellar spectra and classification; historical models of the solar system; Kepler's law, gravitation; physical geology of the planets and formation of the solar system; phenomena of astronomical origin; brief introduction to stars and galaxies. This course includes practical exercises and field trips.
Credit points: 12  Contact hours: 5 per week  Campus: Gardens Point  Teaching period: 2010 SEM-2

SCB384 FORENSIC SCIENCES - FROM CRIME SCENE TO COURT
This unit provides an introduction to two fundamental areas in forensic science, crime scenes and justice. Mock crime scenes involving real life scenarios are used to provide hands-on training on crime scene management and examination protocols. The principles for forensic examination of crime scenes involving fire, explosion, murder, etc, are introduced through lectures, workshops and practical exercises. Also an overview of the techniques used in forensic photography, fingerprinting as well as Legal procedures at court is presented. This unit is provided by professional forensic practitioners with practical real life experience being transferred to new generations. This head start provides a unique advantage for a strong career in forensics.

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