Bachelor of Engineering (Electrical)/ Bachelor of Mathematics (IF21)

Year offered: 2011
Admissions: Yes
CRICOS code: 020329J
Course duration (full-time): 5 years
Domestic Fees (indicative): 2011: CSP $2,883 (indicative) per semester
International Fees (indicative): 2011: $11,875 (indicative) per semester
Domestic Entry: February
International Entry: February
QTAC code: 419572
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.qut.edu.au/assumed-knowledge
Total credit points: 480
Standard credit points per full-time semester: 48
Course coordinator: Dr R. Mahalinga-Iyer (Engineering); Professor Helen MacGillivray (Science & Technology)
Discipline coordinator: Dr Bouchra Senadji (Engineering); Professor Helen MacGillivray (Mathematics Major)
Campus: Gardens Point

Professional Recognition
This course meets the requirements for membership of Engineers Australia (EA). EA is a signatory to the Washington Accord, which permits graduates from accredited member courses to work in various countries across the world. The course also meets the coursework requirements for accredited graduate membership of the Australian Mathematical Society. You may also become a member of the Statistical Society of Australia.

Other Course Requirements
Bachelor of Engineering students are required to complete at least 60 days of industrial experience in an engineering environment approved by the course coordinator.

Financial Support
You should consider applying for an industry-sponsored mathematics bursary or an engineering scholarship to help you financially throughout your studies. For further information visit scholarships.

Recommended study
Chemistry, Maths C and Physics.

International Student Entry
International students must maintain an enrolment program that will allow them to complete their course within the specified timeframe of their eCoE (electronic Confirmation of Enrolment).

Limits on grades of 3
A new policy concerning grades of 3 came into effect from 1 January 2009 (QUT MOPP C/5.2). With effect from this date grades of 3 are no longer considered a conceded or low pass but are classified as a fail grade. Any grades of 3 awarded prior to 1 January 2009 retain the conceded pass status and will be counted for graduation purposes up to the maximum number of grades of 3 permitted for your course. Grades of 3 incurred in units that commence after 1 January 2009 will not count towards your degree. Further information is available on the Student Services website

Further Information
For further information about this course, please contact the following:

Engineering Coordinator
Dr Bouchra Senadji
Phone: 3138 8228
Email: bee.enquiries@qut.com

Science & Technology Coordinator
Professor Helen MacGillivray
Phone: +61 7 3138 2337
Email: h.macgillivray@qut.edu.au

Course structure - For students commencing in 2011 (Maths B only)

<table>
<thead>
<tr>
<th>Year 1, Semester 1</th>
</tr>
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<tbody>
<tr>
<td>ENB100 Engineering and Sustainability</td>
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<tr>
<td>ENB130 Mechanical and Thermal Energy</td>
</tr>
<tr>
<td>MAB101 Statistical Data Analysis 1</td>
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<tr>
<td>MAB120 Algebra and Calculus</td>
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Year 1, Semester 2

For students with four semesters of Senior Mathematics B (or equivalent) only, with an exit assessment of at least Sound Achievement.
### Course Structure - For students commencing in 2011 (Maths B and Maths C)

For students with four semesters of both Senior Mathematics B and Senior Mathematics C (or equivalent) with an exit assessment of at least Sound Achievement in both subjects.

#### Year 1, Semester 1
- ENB100 Engineering and Sustainability
- ENB130 Mechanical and Thermal Energy
- MAB121 Calculus and Differential Equations
- MAB122 Algebra and Analytic Geometry

#### Year 1, Semester 2
- ENB200 Introducing Engineering Systems
- ENB120 Electrical Energy and Measurements
- MAB101 Statistical Data Analysis 1
- MAB220 Computational Mathematics 1

#### Year 2, Semester 1
- ENB110 Engineering Statics and Materials
- ENB250 Electrical Circuits
- MAB120 Calculus and Differential Equations
- MAB122 Algebra and Analytic Geometry

#### Year 2, Semester 2
- ENB150 Introducing Engineering Design
- MAB210 Statistical Modelling 1
- MAB413 Differential Equations
  - Mathematics Elective (Level 2)

#### Year 3, Semester 1
- ENB240 Introduction To Electronics
- ENB246 Engineering Problem Solving
- MAB312 Linear Algebra
- MAB314 Statistical Modelling 2

#### Year 3, Semester 2
- ENB242 Introduction To Telecommunications
- ENB243 Linear Circuits and Systems
- ENB244 Microprocessors and Digital Systems
- ENB245 Introduction To Design and Professional Practice

#### Year 4, Semester 1
- ENB301 Instrumentation and Control
- ENB340 Power Systems and Machines
- ENB342 Signals, Systems and Transforms
  - Mathematics Elective (Level 3)

#### Year 4, Semester 2
- ENB345 Advanced Design and Professional Practice
- MAB414 Applied Statistics 2
  - Mathematics Elective (Level 3)
  - Mathematics Elective (Level 3)

#### Year 5, Semester 1
- BEB701 Work Integrated Learning 1
- BEB801 Project 1
- ENB241 Software Systems Design
  - OR Electrical Engineering Selective
- ENB346 Digital Communications

#### Year 5, Semester 2
- BEB802 Project 2
- ENB344 Industrial Electronics
  - Electrical Engineering Selective
  - Mathematics Elective (Level 3)
  - Mathematics Elective (Level 3)
<table>
<thead>
<tr>
<th>Year 2, Semester 1</th>
<th>Year 2, Semester 2</th>
<th>Year 3, Semester 1</th>
<th>Year 3, Semester 2</th>
<th>Year 4, Semester 1</th>
<th>Year 4, Semester 2</th>
<th>Year 5, Semester 1</th>
<th>Year 5, Semester 2</th>
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<tr>
<td>ENB110 Engineering Statics and Materials</td>
<td>ENB250 Electrical Circuits</td>
<td>MAB210 Statistical Modelling 1</td>
<td>MAB311 Advanced Calculus</td>
<td>ENB240 Introduction To Electronics</td>
<td>ENB246 Engineering Problem Solving</td>
<td>MAB312 Linear Algebra</td>
<td>MAB314 Statistical Modelling 2</td>
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<tr>
<td>ENB150 Introducing Engineering Design</td>
<td>MAB413 Differential Equations</td>
<td>Mathematics Elective (Level 2)</td>
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<td>ENB242 Introduction To Telecommunications</td>
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<td>ENB244 Microprocessors and Digital Systems</td>
<td>ENB245 Introduction To Design and Professional Practice</td>
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<td>BEB701 Work Integrated Learning 1</td>
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<td>ENB339 Introduction to Robotics</td>
<td>ENB448 Signal Processing and Filtering</td>
<td>ENB452 Advanced Power Systems Analysis</td>
<td>ENB453 Power Equipment and Utilisation</td>
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<td>ENB456 Energy</td>
<td>ENB457 Controls, Systems and Applications</td>
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<td>MAB313 Mathematics of Finance</td>
<td>MAB420 Computational Mathematics 2</td>
<td>MAB422 Mathematical Modelling</td>
<td>MAB461 Discrete Mathematics</td>
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<td>MAB480 Introduction to Scientific Computation</td>
<td>MAB315 Operations Research 2</td>
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<td>MAB521 Applied Mathematics 3</td>
<td>MAB522 Computational Mathematics 3</td>
<td>MAB524 Statistical Inference</td>
<td>MAB525 Operations Research 3A</td>
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<td>MAB533 Statistical Techniques</td>
<td>MAB536 Time Series Analysis</td>
<td>MAB613 Partial Differential Equations</td>
<td>MAB623 Financial Mathematics</td>
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<td>MAB624 Applied Statistics 3</td>
<td>MAB625 Operations Research 3B</td>
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<td>MAB672 Advanced Mathematical Modelling</td>
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<td>- Some deviations from the above course structure may be possible with the permission of the course coordinator. This is more likely to apply in the later years than the earlier years of the course.</td>
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</tbody>
</table>
### Course structure - For students commencing in 2010 (Maths B only)

For students with four semesters of Senior Mathematics B (or equivalent) only, with an exit assessment of at least Sound Achievement.

#### Year 1, Semester 1
- ENB100  Engineering and Sustainability
- ENB120  Electrical Energy and Measurements
- MAB101  Statistical Data Analysis 1
- MAB120  Algebra and Calculus

#### Year 1, Semester 2
- ENB200  Introducing Engineering Systems
- ENB130  Mechanical and Thermal Energy
- MAB121  Calculus and Differential Equations
- MAB122  Algebra and Analytic Geometry

#### Year 2, Semester 1
- ENB110  Engineering Statics and Materials
- ENB250  Electrical Circuits
- MAB220  Computational Mathematics 1
- MAB311  Advanced Calculus

#### Year 2, Semester 2
- ENB150  Introducing Engineering Design
- MAB210  Statistical Modelling 1
- MAB413  Differential Equations
  - Mathematics Elective (Level 2)

#### Year 3, Semester 1
- ENB240  Introduction To Electronics
- ENB246  Engineering Problem Solving
- MAB312  Linear Algebra
- MAB314  Statistical Modelling 2

#### Year 3, Semester 2
- ENB242  Introduction To Telecommunications
- ENB243  Linear Circuits and Systems
- ENB244  Microprocessors and Digital Systems
- ENB245  Introduction To Design and Professional Practice

#### Year 4, Semester 1
- ENB301  Instrumentation and Control
- ENB340  Power Systems and Machines
- ENB342  Signals, Systems and Transforms
  - Mathematics Elective (Level 3)

#### Year 4, Semester 2
- ENB345  Advanced Design and Professional Practice
- MAB414  Applied Statistics 2
  - Mathematics Elective (Level 3)
  - Mathematics Elective (Level 3)

#### Year 5, Semester 1
- BEB701  Work Integrated Learning 1
- BEB801  Project 1
- ENB241  Software Systems Design
  - OR Electrical Engineering Selective
- ENB346  Digital Communications

#### Year 5, Semester 2
- BEB802  Project 2
- ENB344  Industrial Electronics
  - Electrical Engineering Selective
  - Mathematics Elective (Level 3)

### Course structure - For students commencing in 2009 (Maths B only)

For students with four semesters of Senior Mathematics B (or equivalent) only, with an exit assessment of at least Sound Achievement.

#### Year 1, Semester 1
- BEB100  Introducing Professional Learning
- MAB100  Mathematical Sciences 1A
- MAB101  Statistical Data Analysis 1
- PCB136  Engineering Physics 1C
### Year 1, Semester 2
- **ENB101** Engineering Mechanics 1
- **ENB103** Electrical Engineering
- **MAB111** Mathematical Sciences 1B
- **MAB112** Mathematical Sciences 1C

### Year 2, Semester 1
- **ENB240** Introduction To Electronics
- **ENB246** Engineering Problem Solving
- **MAB220** Computational Mathematics 1
- **MAB311** Advanced Calculus

### Year 2, Semester 2
- **ENB243** Linear Circuits and Systems
- **ENB244** Microprocessors and Digital Systems
- **MAB210** Statistical Modelling 1
- **MAB413** Differential Equations

### Year 3, Semester 1
- **ENB242** Introduction To Telecommunications
- **ENB350** Real-time Computer-based Systems
- **MAB312** Linear Algebra
- **MAB314** Statistical Modelling 2

### Year 3, Semester 2
- **BEB200** Introducing Sustainability
- **ENB245** Introduction To Design and Professional Practice
- **ENB352** Communication Environments For Embedded Systems
- **MAB414** Applied Statistics 2

### Year 4, Semester 1
- **ENB301** Instrumentation and Control
- **ENB340** Power Systems and Machines
- **ENB342** Signals, Systems and Transforms
  - Mathematics elective (Level 2)

### Year 4, Semester 2
- **ENB345** Advanced Design and Professional Practice
- **ENB346** Digital Communications
- **ENB458** Modern Control Systems
  - Mathematics elective (Level 3)

### Year 5, Semester 1
- **BEB701** Work Integrated Learning 1
- **BEB801** Project 1
- **Mathematics elective (Level 2)**

### Year 5, Semester 2
- **BEB802** Project 2
- **ENB344** Industrial Electronics
  - Mathematics elective (Level 3)
  - Mathematics elective (Level 3)

### Electrical Engineering Selectives
- **ENB339** Introduction to Robotics
- **ENB440** RF Techniques and Modern Applications
- **ENB441** Applied Image Processing
- **ENB445** RF Communication Technologies
- **ENB446** Wireless Communications
- **ENB448** Signal Processing and Filtering
- **ENB452** Advanced Power Systems Analysis
- **ENB453** Power Equipment and Utilisation
- **ENB454** Power System Management
- **ENB455** Power Electronics
- **ENB456** Energy
- **ENB457** Controls, Systems and Applications
- **INB353** Wireless and Mobile Networks
- **INB860** Computational Intelligence for Control and Embedded Systems

Course structure - For students commencing in 2007 & 2008 (Maths B only)

For students with four semesters of Senior Mathematics B (or equivalent) only, with an exit assessment of at least Sound Achievement.

### Year 1, Semester 1
- **BEB100** Introducing Professional Learning
- **MAB100** Mathematical Sciences 1A
- **MAB101** Statistical Data Analysis 1
- **PCB136** Engineering Physics 1C

### Year 1, Semester 2
- **ENB101** Engineering Mechanics 1
- **ENB103** Electrical Engineering
- **MAB111** Mathematical Sciences 1B
### Course Structure

#### Year 1, Semester 1
- **BEB100** Introducing Professional Learning
- **MAB100** Mathematical Sciences 1A
- **MAB101** Statistical Data Analysis 1
- **PCB136** Engineering Physics 1C

#### Year 1, Semester 2
- **ENB101** Engineering Mechanics 1
- **ENB103** Electrical Engineering
- **MAB111** Mathematical Sciences 1B
- **MAB112** Mathematical Sciences 1C

#### Year 5, Semester 2
- **BEB802** Project 2
- **ENB344** Industrial Electronics
  - Mathematics elective (Level 3)
  - Mathematics elective (Level 3)

#### Electrical Engineering Selectives
- **ENB339** Introduction to Robotics
- **ENB440** RF Techniques and Modern Applications
- **ENB441** Applied Image Processing
- **ENB445** RF Communication Technologies
- **ENB446** Wireless Communications
- **ENB448** Signal Processing and Filtering
- **ENB452** Advanced Power Systems Analysis
- **ENB453** Power Equipment and Utilisation
- **ENB454** Power System Management
- **ENB455** Power Electronics
- **ENB456** Energy
- **ENB457** Controls, Systems and Applications
- **INB353** Wireless and Mobile Networks
- **INB860** Computational Intelligence for Control and Embedded Systems

For students commencing in 2006 (Maths B only)

Course structure - For students with four semesters of Senior Mathematics B (or equivalent) only, with an exit assessment of at least Sound Achievement.

#### Year 4, Semester 1
- **ENB301** Instrumentation and Control
- **ENB340** Power Systems and Machines
- **ENB342** Signals, Systems and Transforms
  - Mathematics elective (Level 2)

#### Year 4, Semester 2
- **ENB345** Advanced Design and Professional Practice
- **ENB346** Digital Communications
- **ENB458** Modern Control Systems
  - Mathematics elective (Level 3)

#### Year 5, Semester 1
- **BEBe701** Work Integrated Learning 1
- **BEBe801** Project 1
  - Electrical Engineering Selective
  - Mathematics elective (Level 3)
MAB220  Computational Mathematics 1
MAB311  Advanced Calculus

Year 2, Semester 2
ENB243  Linear Circuits and Systems
ENB244  Microprocessors and Digital Systems
MAB210  Statistical Modelling 1
MAB413  Differential Equations

Year 3, Semester 1
ENB242  Introduction To Telecommunications
ENB350  Real-time Computer-based Systems
MAB312  Linear Algebra
MAB314  Statistical Modelling 2

Year 3, Semester 2
ENB245  Introduction To Design and Professional Practice
ENB352  Communication Environments For Embedded Systems
MAB420  Computational Mathematics 2
MAB480  Introduction to Scientific Computation
OR
Computing Elective

Year 4, Semester 1
ENB301  Instrumentation and Control
ENB340  Power Systems and Machines
ENB342  Signals, Systems and Transforms
Mathematics elective (Level 2)

Year 4, Semester 2
ENB345  Advanced Design and Professional Practice
ENB346  Digital Communications
ENB458  Modern Control Systems
Mathematics elective (Level 3)

Year 5, Semester 1
BEB701  Work Integrated Learning 1
BEB801  Project 1
Electrical Engineering Selective
Mathematics elective (Level 3)

Year 5, Semester 2
BEB802  Project 2
ENB344  Industrial Electronics
Mathematics elective (Level 3)

Electrical Engineering Selectives
ENB440  RF Techniques and Modern Applications
ENB441  Applied Image Processing
ENB445  RF Communication Technologies
ENB446  Wireless Communications
ENB448  Signal Processing and Filtering
ENB452  Advanced Power Systems Analysis
ENB453  Power Equipment and Utilisation
ENB454  Power System Management
ENB455  Power Electronics
ENB456  Energy
ENB457  Controls, Systems and Applications
ENB353  Wireless and Mobile Networks
INB860  Computational Intelligence for Control and Embedded Systems

Course structure - For students commencing in 2010 (Maths B and Maths C)

For students with four semesters of both Senior Mathematics B and Senior Mathematics C (or equivalent) with an exit assessment of at least Sound Achievement in both subjects.

Year 1, Semester 1
ENB100  Engineering and Sustainability
ENB120  Electrical Energy and Measurements
MAB121  Calculus and Differential Equations
MAB122  Algebra and Analytic Geometry

Year 1, Semester 2
ENB200  Introducing Engineering Systems
ENB130  Mechanical and Thermal Energy
MAB101  Statistical Data Analysis 1
MAB220  Computational Mathematics 1

Year 2, Semester 1
ENB110  Engineering Statics and Materials
ENB250  Electrical Circuits
MAB210  Statistical Modelling 1
MAB311  Advanced Calculus

Year 2, Semester 2
## Course Structure - For students commencing in 2009 (Maths B and Maths C)

- **Year 1, Semester 1**
  - BEB100 Introducing Professional Learning
  - MAB111 Mathematical Sciences 1B
  - MAB112 Mathematical Sciences 1C
  - PCB136 Engineering Physics 1C

- **Year 1, Semester 2**
  - ENB101 Engineering Mechanics 1
  - ENB103 Electrical Engineering
  - MAB101 Statistical Data Analysis 1
  - MAB220 Computational Mathematics 1

- **Year 2, Semester 1**
  - ENB240 Introduction To Electronics
  - ENB246 Engineering Problem Solving
  - MAB210 Statistical Modelling 1
  - MAB311 Advanced Calculus

- **Year 2, Semester 2**
  - BEB200 Introducing Sustainability
  - ENB243 Linear Circuits and Systems
  - ENB244 Microprocessors and Digital Systems
  - MAB413 Differential Equations

- **Year 3, Semester 1**
  - ENB242 Introduction To Telecommunications
  - ENB452 Advanced Power Systems Analysis
  - ENB453 Power Equipment and Utilisation
  - ENB456 Energy
  - ENB457 Controls, Systems and Applications
  - ENB458 Modern Control Systems

- **Year 3, Semester 2**
  - ENB348 Signal Processing and Filtering
  - ENB452 Advanced Power Systems Analysis
  - ENB453 Power Equipment and Utilisation
  - ENB456 Energy
  - ENB457 Controls, Systems and Applications
  - ENB458 Modern Control Systems

For students with four semesters of both Senior Mathematics B and Senior Mathematics C (or equivalent) with an exit assessment of at least Sound Achievement in both subjects.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>ENB245</td>
<td>Introduction To Design and Professional Practice</td>
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<tr>
<td>ENB352</td>
<td>Communication Environments For Embedded Systems</td>
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<tr>
<td>MAB414</td>
<td>Applied Statistics 2</td>
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<td>Mathematics elective (Level 2)</td>
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</table>

### Year 4, Semester 1

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<td>Signals, Systems and Transforms</td>
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<td>Mathematics elective (Level 2)</td>
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### Year 4, Semester 2

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<td>ENB345</td>
<td>Advanced Design and Professional Practice</td>
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<td>ENB346</td>
<td>Digital Communications</td>
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<td>ENB458</td>
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<td>Mathematics elective (Level 3)</td>
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### Year 5, Semester 1

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<td>BEB801</td>
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<td>Electrical Engineering Selective</td>
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### Year 5, Semester 2

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<td>Project 2</td>
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<td>ENB344</td>
<td>Industrial Electronics</td>
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<td>Mathematics elective (Level 3)</td>
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### Electrical Engineering Selectives

<table>
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<th>Course Code</th>
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<tr>
<td>ENB339</td>
<td>Introduction to Robotics</td>
</tr>
<tr>
<td>ENB440</td>
<td>RF Techniques and Modern Applications</td>
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<td>ENB441</td>
<td>Applied Image Processing</td>
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<td>Power System Management</td>
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<td>Power Electronics</td>
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<td>ENB456</td>
<td>Energy</td>
</tr>
<tr>
<td>ENB457</td>
<td>Controls, Systems and Applications</td>
</tr>
<tr>
<td>INB353</td>
<td>Wireless and Mobile Networks</td>
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<tr>
<td></td>
<td>Mathematics elective (Level 2 or 3)</td>
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</tbody>
</table>

### INB860

**Mathematics elective (Level 3)**

Course structure - For students commencing in 2007 & 2008 (Maths B and Maths C)

For students with four semesters of both Senior Mathematics B and Senior Mathematics C (or equivalent) with an exit assessment of at least Sound Achievement in both subjects.

<table>
<thead>
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<td>Introduction To Electronics</td>
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<tr>
<td>ENB243</td>
<td>Linear Circuits and Systems</td>
</tr>
<tr>
<td>ENB244</td>
<td>Microprocessors and Digital Systems</td>
</tr>
<tr>
<td>MAB413</td>
<td>Differential Equations</td>
</tr>
<tr>
<td></td>
<td>Mathematics elective (Level 2 or 3)</td>
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### Year 3, Semester 1

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<th>Course Code</th>
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<tr>
<td>ENB350</td>
<td>Real-time Computer-based Systems</td>
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<td>Communication Environments For Embedded Systems</td>
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<td>MAB414</td>
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### Year 3, Semester 2

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<tbody>
<tr>
<td>ENB458</td>
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Mathematics elective (Level 2)

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<td>Instrumentation and Control</td>
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<tr>
<td>Power Systems and Machines</td>
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<tr>
<td>ENB345</td>
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<tr>
<td>Advanced Design and Professional Practice</td>
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<td>ENB346</td>
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<tr>
<td>Digital Communications</td>
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<td>ENB458</td>
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<th>Year 5, Semester 1</th>
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<td>BEB701</td>
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<td>Work Integrated Learning 1</td>
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<td>BEB801</td>
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<td>Project 1</td>
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<td>Project 2</td>
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Electrical Engineering Selectives

| ENB339            |
| Introduction to Robotics |
| ENB440            |
| RF Techniques and Modern Applications |
| ENB441            |
| Applied Image Processing |
| ENB445            |
| RF Communication Technologies |
| ENB446            |
| Wireless Communications |
| ENB448            |
| Signal Processing and Filtering |
| ENB452            |
| Advanced Power Systems Analysis |
| ENB453            |
| Power Equipment and Utilisation |
| ENB454            |
| Power System Management |
| ENB455            |
| Power Electronics |
| ENB456            |
| Energy |
| ENB457            |
| Controls, Systems and Applications |
| INB353            |
| Wireless and Mobile Networks |
| INB860            |
| Computational Intelligence for Control and Embedded Systems |

Course structure - For students commencing in 2006 (Maths B and Maths C)

For students with four semesters of both Senior Mathematics B and Senior Mathematics C (or equivalent) with an exit assessment of at least Sound Achievement in both subjects.

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<tbody>
<tr>
<td>BEB100</td>
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<tr>
<td>Introducing Professional Learning</td>
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<tr>
<td>MAB111</td>
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<tr>
<td>Mathematical Sciences 1B</td>
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<tr>
<td>MAB112</td>
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<td>Mathematical Sciences 1C</td>
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<td>PCB136</td>
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<td>Engineering Physics 1C</td>
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<td>ENB103</td>
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<td>MAB220</td>
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<td>Introduction To Electronics</td>
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<td>ENB246</td>
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<td>MAB210</td>
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<td>Statistical Modelling 1</td>
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<td>MAB311</td>
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<td>ENB243</td>
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<td>Linear Circuits and Systems</td>
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<td>ENB244</td>
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<tr>
<td>Microprocessors and Digital Systems</td>
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<td>Differential Equations</td>
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<td>ENB350</td>
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<td>Real-time Computer-based Systems</td>
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<td>MAB480</td>
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<td>Introduction to Scientific Computation</td>
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Year 4, Semester 1
ENB301 Instrumentation and Control
ENB340 Power Systems and Machines
ENB342 Signals, Systems and Transforms
Mathematics elective (Level 2)

Year 4, Semester 2
ENB345 Advanced Design and Professional Practice
ENB346 Digital Communications
ENB458 Modern Control Systems
Mathematics elective (Level 3)

Year 5, Semester 1
BEB701 Work Integrated Learning 1
BEB801 Project 1
Electrical Engineering Selective
Mathematics elective (Level 3)

Year 5, Semester 2
BEB802 Project 2
ENB344 Industrial Electronics
Mathematics elective (Level 3)
Mathematics elective (Level 3)

Electrical Engineering Selectives
ENB440 RF Techniques and Modern Applications
ENB441 Applied Image Processing
ENB445 RF Communication Technologies
ENB446 Wireless Communications
ENB448 Signal Processing and Filtering
ENB452 Advanced Power Systems Analysis
ENB453 Power Equipment and Utilisation
ENB454 Power System Management
ENB455 Power Electronics
ENB456 Energy
ENB457 Controls, Systems and Applications
INB353 Wireless and Mobile Networks
INB860 Computational Intelligence for Control and Embedded Systems

Potential Careers:
Electrical and Computer Engineer, Electrical Engineer, Mathematician, Statistician.

UNIT SYNOPSISES

BEB100 INTRODUCING PROFESSIONAL LEARNING
This unit will introduce students to a range of skills and knowledge sets required to support professional practice in design, engineering and urban development disciplines. It will include information literacy and communication skills and knowledge development. In addition, the unit will provide orientation to design, engineering and urban development professions through an introduction to their history, their place in society, the importance of ethical conduct to their practice and to the particular qualities of professional knowledge especially with regard to practice knowledge. The importance of integrated scholarship and collaborative links with other professions will be highlighted.

Equivalents: BNB007, CNB190, PSB414 Credit points: 12 Contact hours: 3 per week Campus: Gardens Point

BEB200 INTRODUCING SUSTAINABILITY
This unit will address issues of sustainability from a number of perspectives thus providing students with a variety of lenses on the ways in which the human-made environment impacts on the future of human settlement. The unit will include an introduction to sustainability from a variety of perspectives, including indigenous and other cultural perspectives, and from ecological, economic and technological perspectives. It will demonstrate to students the ways in which contrasting, and sometimes conflicting, ideas about sustainability are prioritised and how these priorities contribute to the impact that design, engineering and urban development professions have on a sustainable future.

Equivalents: PSB422 Credit points: 12 Contact hours: 3 per week Campus: Gardens Point

BEB701 WORK INTEGRATED LEARNING 1
This unit aims to provide you with the opportunity to learn in a workplace environment. It will involve attendance, participation, observation, critical reflection, and report writing on workplace activities. The emphasis of your critical reflection and report writing will be on identifying and describing aspects of professional relevance incorporating: collaboration and teamwork; workplace, health and safety; professional conduct; ethical responsibility, and other aspects of your workplace experience.

This unit may form part of your (compulsory) course core (as required by professional accrediting bodies e.g. Engineers Australia, Australian Institute of Building, Royal Institution of Chartered Surveyors), or it may be one of several work integrated learning (WIL) units (selected as part of a Minor).

Assumed knowledge: This unit is not designed for first year students. It is recommended that you check WIL
Community Blackboard site for information on enrolment pattern. If you are EN40 student you can only enrol after completing a minimum of 192 cp.  

**ENB103 ELECTRICAL ENGINEERING**  
Fundamental quantities in circuits and network laws, response to sinusoidal sources, and circuit measurements, real and reactive power calculation, power factor improvement, electric and magnetic fields, three-phase system and applications, transformer theory.  
**Prerequisites:** MAB126 or MAB131 or MAB180  
**Equivalents:** EEB213  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

**ENB110 ENGINEERING STATICS AND MATERIALS**  
Credit points: 12  
Contact hours: 4 per week  
Campus: Gardens Point  
Teaching period: 2011 SEM-1 and 2011 SEM-2

**ENB120 ELECTRICAL ENERGY AND MEASUREMENTS**  
This unit introduces you to basic electrical circuit concepts. It requires you to perform circuit analysis, circuit synthesis, and the measurement and testing of relevant quantities within circuits.  
**Credit points:** 12  
**Contact hours:** 3 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2 and 2011 SUM

**ENB130 MECHANICAL AND THERMAL ENERGY**  
Engineers work with numerous kinds of systems where consideration must be given to the motion within, and associated energy of, the system. This unit introduces the student to the concepts of mechanical and thermal energy in the context of real engineering systems. The inter-relationships of between forces, motion and energy is described as related to the flow of energy within these engineering systems. After an introduction to engineering units, concepts and data, Newton’s first and second laws are introduced and described. Thermodynamic processes, certain thermo-physical parameters and the first and second law of thermodynamics are introduced and used to describe simple engineering systems. This is then expanded to include the generation and transport of energy through these systems in terms of convection, conduction and radiation heat transfer.  
**Equivalents:** PCB150  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**ENB150 INTRODUCING ENGINEERING DESIGN**  
This unit introduces you to engineering design. A multi-disciplinary approach is taken with an emphasis in engineering systems, technical design and project management.  
**Assumed knowledge:** ENB110 is assumed knowledge.  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:**
ENB200 INTRODUCING ENGINEERING SYSTEMS
This unit will enable you as a graduating Built Environment and Engineering professional to take active and positive steps to transform professional practice in ways that promote the sustainability of our planet, our economy and our society. As future professionals in the fields of Design, Urban Development and Engineering Systems, you will need to understand and apply the concepts of sustainability in your professional practice if we are to achieve sustainable development in the 21st Century.

Credit points: 12  Campus: Gardens Point  Teaching period: 2011 SEM-2

ENB240 INTRODUCTION TO ELECTRONICS
Module Electronics A provides a basic understanding of the characteristics and operation of discrete semiconductor components. Electronic circuit design is introduced with emphasis on the small signal low and high frequency response of those circuits. Module Digital Electronics gives students a good grounding in the basic principles of digital design, with particular regard to the fundamentals of digital number systems, Boolean algebra, combinational and sequential logic design.

Prerequisites: ENB103 or ENB120  Equivalents: EEB312  Credit points: 12  Contact hours: 5 per week  Campus: Gardens Point  Teaching period: 2011 SEM-1

ENB241 SOFTWARE SYSTEMS DESIGN
The unit introduces students to Software Engineering by considering a whole Software Lifecycle. Each step of the lifecycle is treated in detail, such as concept phase, requirement definition, software design, human-computer interaction, implementation, audits, and maintenance. Software design principles and techniques are presented as well as real-time system design. CASE development tools are briefly introduced as well as object oriented programming for which a structured Object Oriented Analysis and Design are considered.

Prerequisites: ENB246 or INB104  Equivalents: EEB612  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-2

ENB242 INTRODUCTION TO TELECOMMUNICATIONS
Telecommunications systems and the principles underlying their operations are introduced starting from mathematical preliminaries such as the Fourier series and the Fourier transform. Analogue modulation techniques (AM and FM), systems and circuits for generation and demodulation, analogue to digital conversion, pulse modulation and base-band digital data communication techniques are studied using time and frequency domain analyses.

Prerequisites: (ENB120 or ENB103) and (MAB126 or MAB110 or MAB111)  Equivalents: EEB340  Credit points: 12  Contact hours: 3 per week  Campus: Gardens Point  Teaching period: 2011 SEM-1 and 2011 SEM-2

ENB243 LINEAR CIRCUITS AND SYSTEMS
Network analysis; Laplace transform of signals and transfer functions of systems, time and frequency responses of linear circuits, feedback configurations and transfer functions, analyse and designing analogue systems using transistors and operational amplifiers, designing and synthesising analogue filters, signal conditioning.

Prerequisites: ENB120 and MAB126  Assumed knowledge: ENB240 is assumed knowledge.  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-2

ENB244 MICROPROCESSORS AND DIGITAL SYSTEMS
This unit covers the basis for electronic circuit design in general but also in connection with microprocessor systems, theory and design of advanced embedded digital systems and practical implementation. The practical application of these circuits including interfacing and environment factors will be considered.

Prerequisites: ENB240  Assumed knowledge: ENB246 or INB104 is assumed knowledge.  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-2

ENB245 INTRODUCTION TO DESIGN AND PROFESSIONAL PRACTICE
Introduction to general principles of electronic circuit and electrical equipment design and realisation; design and implementation of basic electronic circuits; experience in undertaking engineering projects, in report writing, and working in teams. The unit gives students the opportunity to apply their theoretical knowledge to real-life engineering problems.

Assumed knowledge: ENB240 and ENB246 or INB104 is assumed knowledge.  Equivalents: EEB584  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-2

ENB246 ENGINEERING PROBLEM SOLVING
This unit introduces students to the use of computers as tools for solving engineering problems. MATLAB is introduced as a numerical computing environment with the capacity to support complex mathematics and to be programmed to solve specific engineering problems. Stand alone application development using C++ is introduced as a means of exposing students to the high and low level computer programming concepts that are necessary to the implementation of engineering solutions in hardware specific programming environments.

Assumed knowledge: MAB126 or MAB180 or MAB131, and ENB103 or ENB120 is assumed knowledge.  Credit points: 12  Contact hours: 3 per week  Campus: Gardens Point  Teaching period: 2011 SEM-1 and 2011 SEM-2
ENB250 ELECTRICAL CIRCUITS
This unit introduces you to electrical circuit analysis. It shows how to determine the transient and steady state solution in single and three phase circuits as well as the interaction of fluxes and currents in transformers and electrical machines.
Prerequisites: ENB120  Antirequisites: ENB103
Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-1

ENB301 INSTRUMENTATION AND CONTROL
The unit introduces the student to classical control systems, analysis and synthesis, and implementation in an industrial control context. It introduces the principles of electrical measurements and instrumentation, sensors, PLC, DSC and industrial networks, and foundation of feedback control theory for engineers.
Prerequisites: MAB126 or MAB182 or MAB132
Assumed knowledge: ENB105 or ENB205 or ENB243 are assumed knowledge.  Credit points: 12  Contact hours: 5 per week  Campus: Gardens Point  Teaching period: 2011 SEM-1

ENB339 INTRODUCTION TO ROBOTICS
This unit introduces you to the components, systems and mathematical foundations of robotics. The unit introduces the technologies and methods used in the design and programming of modern intelligent robots, and encourages critical thinking about the use of robotic technologies in various applications. The unit emphasizes the practical application of robotic theory to the design and synthesis of robotic systems that respond accurately and repeatably.
Assumed knowledge: ENB201 or ENB221 and ENB222 are assumed knowledge.  Equivalents: MMB451
Credit points: 12  Contact hours: 5 per week  Campus: Gardens Point  Teaching period: 2011 SEM-2

ENB340 POWER SYSTEMS AND MACHINES
This is a core unit that develops the basic topics essential for an electrical engineer working in areas that include the resources sector, the process industries, electrical power utilisation, electric power generators as well as the electricity supply industry. Topics covered in machines include magnetic circuits, single phase and three phase transformers; electric machines including electromechanical energy conversion, reluctance motors, induction motors, synchronous machines, D.C. machines, stepper motors, P.C. motors; motor control; heating, cooling and rating. Power system topics include power generation and energy sources, electricity market operation, fault calculations, basic protection and power system operation, in particular real and reactive power control.

Prerequisites: ENB103 or ENB250  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-1

ENB342 SIGNALS, SYSTEMS AND TRANSFORMS
The unit covers the area of Signals in Linear Systems for which a detailed study of Fourier theory applied to both analogue and discrete-time signals and to the analysis of linear systems will be given. Systems will be represented in time as well as in frequency and various characteristics and relationships in the two domains will be discussed. The students will be introduced to the fundamentals of analogue and discrete-time signal processing; analogue and discrete Fourier transform; linear and discrete convolution. Finally, the students will learn the fundamentals of digital filter design and implementation, with examples and applications arising from various disciplines.
Prerequisites: ENB242  Assumed knowledge: ENB243 and ENB246 are assumed knowledge.  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-1

ENB344 INDUSTRIAL ELECTRONICS
The unit gives a basic understanding of linear and switching applications in industrial electronics. Practical knowledge associated with interfacing and design is developed. Students will also study the theory and design of advanced digital embedded systems as well as the practicalities associated with implementation. It also covers power rectification, controlled rectification, inverters, AC and DC drives, uninterruptible power supplies and power switching components.
Prerequisites: ENB240  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-2

ENB345 ADVANCED DESIGN AND PROFESSIONAL PRACTICE
Detailed design and realisation of typical electronic subsystems used in all areas of electrical and electronic systems engineering. The unit enhances the student's ability in solving complex engineering problems. The design builds on the theoretical knowledge gained in other units. The student is required to write a detailed technical report and also give an oral presentation on her/his design.
Prerequisites: ENB245  Equivalents: EEB864  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-2

ENB346 DIGITAL COMMUNICATIONS
Revolutionary developments in the field of Digital Communication Technology have enabled improvement in the characteristics of communication systems in order to meet the performance requirements for transmission of information for private, business and industrial applications.
This unit which covers Elements of a Digital Communication System aims at providing the students with an in-depth understanding of the theory and applications of digital communication systems and technology.

**Prerequisites:** ENB342    **Assumed knowledge:** MAB233 is assumed knowledge. **Equivalents:** EEB560

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

**ENB350 REAL-TIME COMPUTER-BASED SYSTEMS**

This unit covers the area of embedded systems and real-time kernels. C programming is reviewed in the context of real-time applications where it is often mixed with assembly language. Data representations, input-output programming, concurrency, scheduling, memory management and system initialization are discussed. Programming laboratory exercises introduce development tools and reinforce fundamental concepts such as polling, interrupt driven input-output, serial port communication, pre-emptive and non-preemptive scheduling, resource sharing, priority inversion and deadlock. Students develop a simple real-time process control application using programmable logic and micro-controllers.

**Prerequisites:** ENB244    **Equivalents:** EEB566

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

**ENB352 COMMUNICATION ENVIRONMENTS FOR EMBEDDED SYSTEMS**

This unit addresses the following: computer networks; network programming; open network foundations; embedded systems; client/server; bus architectures; network controllers; distributed systems in automation and process control; embedded Java; distributed objects; distributed databases; distributed operating systems.

**Prerequisites:** ENB350    **Equivalents:** EEB666

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

**ENB440 RF TECHNIQUES AND MODERN APPLICATIONS**

This unit addresses the following: lumped and distributed microwave and RF circuits, including $y$, $t$ and $s$ parameters; impedance matching techniques; passive and active microwave devices; RF circuit design techniques; microwave and RF measurement techniques; linear antennas and microwave antennas; analysis and synthesis of antenna arrays; specialised antennas and antenna measurements; EMC definition, standards and regulations; test plan; measurements; interference coupling; susceptibility; EMC design techniques, component selection, circuit layouts, grounding, shielding, filters, suppressors, isolation and safety; EMC management; propagation of electromagnetic fields in electrical materials; application of numerical methods.

**Prerequisites:** ENB343    **Antirequisites:** ENB445

**Assumed knowledge:** ENB242 and ENB244 are assumed knowledge. **Credit points:** 12    **Contact hours:** 5 per week    **Campus:** Gardens Point    **Teaching period:** 2011 SEM-1

**ENB441 APPLIED IMAGE PROCESSING**

The aim of this unit is to introduce the fundamentals and applications of image processing to the students. The unit covers topics such as image acquisition, image representation, image enhancement, image segmentation, and image filtering. These topics will be introduced using a project based approach with applications to engineering practical problems.

**Prerequisites:** ENB342    **Credit points:** 12    **Contact hours:** 4 per week    **Campus:** Gardens Point    **Teaching period:** 2011 SEM-1

**ENB445 RF COMMUNICATION TECHNOLOGIES**

The unit covers various communication and signal processing technologies that are used in point to point and point to multi-point; wired and wireless communications including microwave terrestrial and satellite communication; last miles solutions including ADSL, VDSL and wireless local loops; ad hoc radio transmission such as the Bluetooth and Home RF; Wireless LANs including wireless infrared transmission and IEEE8012.11 standard.

**Prerequisites:** ENB343    **Assumed knowledge:** ENB242 and ENB244 are assumed knowledge. **Equivalents:** EEB766

**Credit points:** 12    **Contact hours:** 5 per week    **Campus:** Gardens Point

**ENB446 WIRELESS COMMUNICATIONS**

This unit addresses the following: cellular mobile radio system concepts; mobile radio propagation; spread spectrum techniques and CDMA; speech coding modulation and channel coding techniques for GSM and CDMA; fading mitigation through diversity; inter-symbol interference mitigation; the GSM and CDMA standards; the WAP and the GPRS; introductions to UMTS/IMT2000; introduction to personal communications; introduction to blue tooth technology; other wireless systems including wireless LAN, wireless local loop, microwave local multipoint distribution systems (LMDS) and LEO satellite communication.

**Prerequisites:** ENB346    **Equivalents:** EEB860

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

**ENB448 SIGNAL PROCESSING AND FILTERING**

This unit gives a comprehensive introduction to the representation and processing of signals distorted or corrupted by noise, and the systems needed to process them. Techniques for estimating signal parameters for the detection of signals in the presence of noise will be discussed. The methods presented will be tested on real...
data drawn from different engineering applications, such as wireless communications, biomedical EEG signals and brain models, speech and music synthesis, and radars.

**Prerequisites:** ENB342  **Assumed knowledge:** MAB233  
is assumed knowledge. **Equivalents:** EEB941  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2011 SEM-2

### ENB452 ADVANCED POWER SYSTEMS ANALYSIS

The aim of this unit is to introduce you to the basic topics of power system analysis relevant to engineers involved in both operations and planning. Specific tasks will be evaluation of faults on lines, load flow and stability analyses using commercial packages.

**Prerequisites:** ENB340  **Assumed knowledge:** ENB301  
is assumed knowledge. **Credit points:** 12  **Contact hours:** 3 per week  **Campus:** Gardens Point  **Teaching period:** 2011 SEM-2

### ENB453 POWER EQUIPMENT AND UTILISATION

The unit emphasises the use of relevant standards to the specification and design of electrical equipment for the use of electrical energy supply for buildings and lighting. Design approaches emphasise current engineering practise.

**Prerequisites:** ENB340  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2011 SEM-2

### ENB454 POWER SYSTEM MANAGEMENT

The aim of this subject is to develop skills in the operational management and the overall system management of Power systems. There are many decisions to be made in the context of imperfect information. This subject provides tools to provide a degree of structure to the decision process, whether at purchase time or in daily operation. These tools cover the areas of risk analysis, reliability and asset management and extend to the operational areas of utilization of equipment and quality of supply. The outcome is to achieve a balance between maintenance and capital purchases between investment and reliability.

**Prerequisites:** ENB340  **Credit points:** 12  **Contact hours:** 3 per week  **Campus:** Gardens Point  **Teaching period:** 2011 SEM-1

### ENB455 POWER ELECTRONICS

The unit introduces the student to advanced industrial electronics and power converters with different applications. Students learn how to model power converters, design a controller and simulate power electronic systems using Matlab/Simulink software for different applications. They also learn practical issues such as EMI, efficiency and losses to design a controller and power circuits.

**Prerequisites:** ENB344  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2011 SEM-1

### ENB456 ENERGY

Renewable energy sources including solar and wind energies are becoming more important than ever due to increasing energy demand, dwindling oil and gas supplies, increasing pollution levels in the atmosphere and the associated global warming effects. Renewables may also help improve competitiveness and have a positive impact on regional development and employment.

An overview of the different energy sources will be covered followed by an understanding of the characteristics of solar energy, radiation calculation, measurements and applications in remote, hybrid and grid interactive configurations. Students will be equipped with fundamentals of alternative energy sources including solar thermal, photovoltaics and wind conversion technologies.

**Assumed knowledge:** MAB126 or MAB180 or MAB131 are assumed knowledge. **Equivalents:** EEB911  **Credit points:** 12  **Contact hours:** 3 per week  **Campus:** Gardens Point  **Teaching period:** 2011 SEM-2

### ENB457 CONTROLS, SYSTEMS AND APPLICATIONS

Control systems are playing an increasingly important role in process control, energy management and utility management. This unit is concerned with the application of advanced control systems with an emphasis on physical architectures and implementations. Topics covered include control system actuators, sensors and controllers, control system architectures, human machine interfacing, adaptive control strategies and intelligent control.

**Prerequisites:** ENB301  **Assumed knowledge:** This unit is limited to 30 enrolments  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2011 SEM-2

### ENB458 MODERN CONTROL SYSTEMS

This unit introduces the student to the following concepts:

- Discrete time control systems and their design, state space modelling and control system design using state space techniques, linear optimal control, non-linear systems, and adaptive control with applications of neuro-computing and fuzzy logic.

**Prerequisites:** ENB301  **Credit points:** 12  **Contact hours:** 4 per week  **Campus:** Gardens Point  **Teaching period:** 2011 SEM-2

### INB353 WIRELESS AND MOBILE NETWORKS

This unit provides you with the skills to be able to design and understand the issues involved with different types of wireless communications systems. It develops your knowledge of Wide Area Networks (WANs), Local Area Networks (LANs) and Personal Area Networks (PANs) as well as skills in programming for mobile handsets. You will also develop knowledge of the different types of wireless communications systems.
communications technologies available and when each is most applicable in a particular situation.

Prerequisites: INB251 or ITB006  Antirequisites: ITN723  
Assumed knowledge: Networks or equivalent networking knowledge is assumed knowledge  
Equivalents: ITB723  

Credit points: 12  Contact hours: 3 per week  
Campus: Gardens Point  
Teaching period: 2011 SEM-1

INB860 COMPUTATIONAL INTELLIGENCE FOR CONTROL AND EMBEDDED SYSTEMS
This is a specialisation unit in the area of Infomechatronics that introduces five methods from the field of computational intelligence and relates them to applications on real time control and embedded systems. The methods are: Knowledge Base Systems, Fuzzy Control, Neural Networks, Reinforcement Learning and Evolutionary Computation. The unit is also intended to teach the specific design and programming skills that will enable you to solve problems using computational intelligence methods in real-time embedded systems. It is assumed that you already have knowledge of programming.

Assumed knowledge: Knowledge of a programming language like Python, Java or C is assumed.

Equivalents: ITB847  Credit points: 12  Contact hours: 3 per week  
Campus: Gardens Point  
Teaching period: 2011 SEM-1

MAB100 MATHEMATICAL SCIENCES 1A
To enrol you should have (1) at least Sound Achievement in 4 semesters of Mathematics B, or (2) a grade of least 4 in MAB105, or (3) the equivalent. This unit will reinforce the notion of a function with particular emphasis on polynomial, trigonometric, exponential and logarithmic functions including arithmetic and geometric progressions and the binomial theorem. Calculus will be reviewed and expanded with an emphasis on integration and on integration techniques and applications. Vectors and matrices will be introduced with vectors interpreted geometrically and algebraically and matrices as representations of linear systems, with applications. If time permits, complex numbers will be introduced. This unit is incompatible with HA in Senior Mathematics C.

Prerequisite(s): MAB105 or SA in Senior Maths B (or equivalent)  
Credit points: 12  Contact hours: 4 per week  
Campus: Gardens Point  
Teaching period: 2009 SEM-1, 2009 SEM-2 and 2009 SUM  
Incompatible with: 
Prior pass in MAB180, MAB131, HA in Senior Maths C

MAB101 STATISTICAL DATA ANALYSIS 1
Experiments, observational studies, sampling, and polls; data and variables; framework for describing and manipulating probability; independence; Binomial and Normal distributions; population parameters and sample statistics; concepts of estimation and inference; standard error; confidence intervals for means and proportions; tests of hypotheses on means and proportions (one sample and two independent samples); inference using tables of counts; modelling relationships using regression analysis; model diagnosis; use of statistical software.

Antirequisites: BSB123, EFB101, MAB141, MAN101, MAB233  
Assumed knowledge: Grade of at least Sound Achievement in Senior Mathematics B (or equivalent) or MAB105 is assumed knowledge.  
Credit points: 12  Contact hours: 4 per week  
Campus: Gardens Point  

MAB111 MATHEMATICAL SCIENCES 1B
Limits and continuity, including limits of rational functions, functions involving radicals, trigonometric functions; L'Hopital's Rule; differentiation techniques - parametric, logarithmic; inverse functions and their derivatives; partial derivatives. Introduction to differential equations and mathematical modelling. Riemann sums, fundamental theorems of integral calculus; applications including solids of revolution and first-order-separable differential equations. Taylor series, Fourier series and applications. Students must have completed four semesters of Senior Mathematics C with an exit achievement of Sound Achievement, or have passed MAB100 (or equivalent).

Assumed knowledge: Grade of at least Sound Achievement in Senior Mathematics C (or equivalent) or MAB100 is assumed knowledge.  
Credit points: 12  Contact hours: 4 per week  
Campus: Gardens Point

MAB112 MATHEMATICAL SCIENCES 1C
This unit includes the following: introduction to linear algebra including vectors, matrices and linear systems; the real and complex number systems; first and second order differential equations. Students must have completed four semesters of Senior Mathematics C with an exit level of Sound Achievement, or have passed MAB100 (or equivalent).

Corequisites: MAB111  Credit points: 12  Contact hours: 4 per week  
Campus: Gardens Point

MAB120 ALGEBRA AND CALCULUS
This unit introduces and reviews the elementary concepts of function, calculus, matrices and vectors with special reference to applications in science, technology and business where appropriate. Topics covered include the algebra of complex numbers, elementary functions (polynomial, trigonometric, exponential and logarithmic) and their properties, differentiation and integration methods and principles, geometric and algebraic applications of vectors and the solution of linear systems using matrices.

Antirequisites: MAN120  
Assumed knowledge: Grade of at least Sound Achievement in Senior Mathematics B (or
MAB212 CALCULUS AND DIFFERENTIAL EQUATIONS
Building upon the foundations established in MAB120 or Senior Maths C, this unit addresses the significant role of mathematical modelling using differential equations for the description and resolution of simple and complex problems relevant to real world situations. The formulation and solution of such problems is supported by appropriate advanced mathematical concepts used for function approximation, differentiation and integration. Undertaking this unit will allow you to develop your problem solving skills, especially in the context of advanced mathematical techniques applied to ordinary differential equations used to model real world problems. You will also gain a deeper understanding of the concepts of the derivative and the integral, and how these may be used in applied contexts.

**Prerequisites:** MAN121

**Antirequisites:** MAB310

**Assumed knowledge:** Grade of at least Sound Achievement in Senior Mathematics C (or equivalent) or MAB120 or MAB100 or MAB125

**Equivalents:** MAB111, MAB126, MAB131, MAB182

**Credit points:** 12

**Contact hours:** 4 per week

**Campus:** Gardens Point

**Teaching period:** 2011 SEM-1, 2011 SUM

MAB122 ALGEBRA AND ANALYTIC GEOMETRY
Building upon the foundations established in MAB120 or Senior Maths C, this unit addresses the significant role of mathematical modelling using vectors, matrices and multivariable calculus for the description and resolution of simple and complex problems relevant in the real world. The formulation and solution of such problems is supported by appropriate advanced mathematical concepts used for function approximation, differentiation and integration. Undertaking this unit will allow you to develop your problem solving skills, especially in the context of advanced mathematical techniques applied to vectors, matrices and multivariable functions used to model real world problems.

**Assumed knowledge:** Grade of at least Sound Achievement in Senior Mathematics C (or equivalent) or MAB120 or MAB100 or MAB125

**Equivalents:** MAB112, MAB127, MAB132

**Credit points:** 12

**Contact hours:** 4 per week

**Campus:** Gardens Point

**Teaching period:** 2011 SEM-1, 2011 SUM

MAB210 STATISTICAL MODELLING 1
This unit is intended for all mathematics degree students, all double degree students with mathematics, secondary education students with mathematics as a teaching area, and quantitatively-oriented students in other courses, particularly in Science, Information Technology, Engineering and areas of Business. The unit will provide you with fundamental skills and operational knowledge for all further study in statistics, and highly relevant foundations for other areas of mathematics such as mathematical modelling and operations research. The unit will also help you develop fundamental problem-solving skills in statistics and mathematics.

**Prerequisites:** MAB121 or MAB122

**Antirequisites:** MAN210

**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:** 2011 SUM

MAB220 COMPUTATIONAL MATHEMATICS 1
Many real world problems are not solvable analytically, meaning that it is necessary to develop computational methods that can be used to solve these problems. Additionally, to be able to apply these methods to large problems, they must be implemented as algorithms in a computer language such as MATLAB. This unit addresses both the theoretical development of computational methods and their implementation in MATLAB. The aim of this unit is to provide you with the introductory concepts, computational techniques and programming skills that will allow you to solve many real world problems. It is also designed to prepare you for study in the advanced units in computational mathematics.

**Antirequisites:** MAN220

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

**Credit points:** 12

**Contact hours:** 4 per week

**Campus:** Gardens Point

**Teaching period:** 2011 SUM

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:** 2011 SUM

MAB312 LINEAR ALGEBRA
This unit covers the following broad topics from linear algebra: matrix analysis; eigenvalues and eigenvectors; vector spaces; inner product spaces.
Differential Equations are among the most important aspects of the theoretical developments of any branch of science. It is often the case that the formulation of mathematical models of real world problems leads to an equation in which a function and its derivatives play a major role. Such equations are examples of differential equations. This unit builds on studies of differential equations in first year and provides a framework for studying partial differential equations and other aspects of applied mathematics in later semesters.

**Prerequisites:** MAB311 or MAB312  
**Antirequisites:** MAN413  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

**MAB413 DIFFERENTIAL EQUATIONS**

This unit focuses on the theory and application of differential equations. It covers topics such as first and second order equations, systems of differential equations, and qualitative methods for understanding solutions. Students will learn how to model real-world phenomena using differential equations and how to analyze their behavior.

**Prerequisites:** MAB121
**Antirequisites:** MAN422
**Credit points:** 12
**Contact hours:** 4 per week
**Campus:** Gardens Point
**Teaching period:** 2011 SEM-2
MAB461 DISCRETE MATHEMATICS
Discrete mathematics is playing an ever increasingly important role in society. We live in an electronic age where information security is of paramount importance, and it is discrete mathematics in the main that provides this security.
In addition, many real world systems are discrete in nature and therefore lend themselves to a discrete analysis. These methods are therefore vital to the professional mathematician and useful to those with an interest in mathematics. This second level unit will provide you with an introduction to discrete and combinatorial mathematics, and give you a mathematical perspective that is different from the traditional coverage in other mathematics units. It will also provide you with valuable methods to apply in other areas of science and computer science.
Prerequisites: MAB112 or MAB122 Credit points: 12 Contact hours: 4 per week Campus: Gardens Point Teaching period: 2011 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.
Antirequisites: ITB849 Credit points: 12 Contact hours: 4 per week Campus: Gardens Point

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: 2011 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 Antirequisites: MAN522 Credit points: 12 Contact hours: 4 per week

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 Contact hours: 4 per week Campus: Gardens Point Teaching period: 2011 SEM-1

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 Antirequisites: MAN525 Credit points: 12 Contact hours: 4 per week Campus: Gardens Point Teaching period: 2011 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: 2011 SEM-1

MAB536 TIME SERIES ANALYSIS
Data in business, economics, engineering and the natural sciences often occur in the form of time series. Time Series Analysis provides models and methods for the analysis of such series of correlated observations. The ability to forecast optimally, to understand causal relationships between variables, and to analyse dynamic systems is of great practical importance. For example, optimal sales forecasts are needed for business planning, transfer function models are needed for improving the design and control of a process plant, and vector time series models are used to represent the relationships and interactions of macroeconomic variables in an economy. This unit is concerned with the building of time series models and the use of such models for practical applications such as optimal forecasting, simulation, causality analysis, and analysis of dynamic systems.
MAB613 PARTIAL DIFFERENTIAL EQUATIONS

Partial differential equations are the classical foundation of mathematical models used to unambiguously describe processes exhibiting spatial and temporal variation. There exist numerous modern important examples of such so-called continuum models and so it is essential that any practising mathematician be conversant with both the background, formulation and solution of such equations. This unit aims to develop your understanding of the construction, analysis, solution and interpretation of partial differential equation models of real-world processes.

Prerequisites: MAB311 and MAB413  Antirequisites: MAN613  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 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: 2011 SEM-2

MAB624 APPLIED STATISTICS 3

Applied statistics provides methods for investigating relationships between variables that arise in data from a variety of areas including science, technology and commerce. The planning of the collection of the data, using ideas of experimental design, and the analysis of the resulting data, using methods based on statistical inference, are fundamental aspects of the statistical process. In addition, communication of results with clear reporting of the conclusions of the analysis is very important. These activities are an important part of decision making processes whatever the context of the application. This unit aims to build on the introductory experimental design and statistical analysis methods presented to you in Applied Statistics 2 in order to introduce modern statistical methods. Additionally, the use of statistical software to carry out analyses and the reporting of conclusions are emphasised.

Prerequisites: MAB414  Antirequisites: MAN624  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-2

MAB625 OPERATIONS RESEARCH 3B

Operations research techniques are used in most industries that are concerned with the application of scientific methods in decision making, especially the allocation of resources. There is thus a need for graduate students who can make decisions on the most appropriate technology to solve a particular problem and implement it. This unit will build on the foundation of previous Operations Research units to develop knowledge and skills in using advanced techniques, tools and methods.

Prerequisites: MAB315  Equivalents: MAN625  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 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  Antirequisites: MAN672  Assumed knowledge: MAB311. Also recommend: MAB413  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-1

PCB136 ENGINEERING PHYSICS 1C

This introductory unit covers: dynamics (motion in 1D, vectors, Newton's Laws, motion in 2D (including circular motion), uniform circular motion, work, energy and power potential energy and conservation of energy, linear momentum and collisions); waves (oscillatory motion, wave motion, sound waves, superposition and standing waves); geometrical optics (reflection, refraction, dispersion, Huygens' principle, image formation by mirrors and lenses, optical instruments); physical optics (interference of light, diffraction); thermal physics (temperature, thermometry, thermal expansion, heat and thermal energy, heat capacity and specific heat, latent heat, heat transfer).

Prerequisites: MAB413  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2009 SEM-1 and 2009 SEM-2