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

Year offered: 2010  
Admissions: Yes  
CRICOS code: 020329J  
Course duration (full-time): 5 years  
Domestic fees (indicative): 2010: CSP $2,800 (indicative) per semester  
International Fees (indicative): 2010: $11,500 (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.studentservices.qut.edu.au/apply/ug/info/knowledge.jsp  
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

Why choose this course?  
Double Degrees are accelerated programs of study that enable a student to obtain two degrees in less time than it would take to obtain them sequentially. The Bachelor of Engineering (Electrical and Computer Eng)/ Bachelor of Mathematics degree takes advantage of overlapping content and relationships between the two individual courses.

Career Outcomes  
Career outcomes for engineering/ mathematics double degree students include working in the power industry, robotics, manufacturing and mining. Career opportunities are also found in the telecommunications industry, transport sector, computer industry and transmission industries.

Recommended study  
Chemistry, Maths C and Physics are recommended.

Overview  
Mathematics and engineering have always had close connections, but recent advancements in mathematics and statistics are increasingly being used to help solve complex engineering problems.

Electrical and computer engineers design, install and maintain electrical, electronic, telecommunications and computing systems on behalf of government and private companies. A stronger training in mathematics and statistics enhances capabilities in modelling, analysis and design.

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.

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.

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 www.scholarships.qut.edu.au

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).

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 the following:

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### 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 Introducing Professional Learning
- ENB120 Electrical Energy and Measurements
- MAB101 Statistical Data Analysis 1
- MAB120 Algebra and Calculus

#### Year 1, Semester 2
- ENB200 Introducing Sustainability
- 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

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### 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.

#### 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)

### Electrical Engineering Selectives
- ENB448 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
least Sound Achievement in both subjects.

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<tr>
<th>Year 1, Semester 1</th>
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<tbody>
<tr>
<td>ENB100</td>
<td>Introducing Professional Learning</td>
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<tr>
<td>ENB120</td>
<td>Electrical Energy and Measurements</td>
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<td>MAB121</td>
<td>Calculus and Differential Equations</td>
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<td>ENB200</td>
<td>Introducing Sustainability</td>
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<td>Mechanical and Thermal Energy</td>
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<tr>
<td>MAB101</td>
<td>Statistical Data Analysis 1</td>
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<td>MAB220</td>
<td>Computational Mathematics 1</td>
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<tr>
<td>ENB110</td>
<td>Engineering Statics and Materials</td>
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<td>ENB250</td>
<td>Electrical Circuits</td>
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<td>MAB210</td>
<td>Statistical Modelling 1</td>
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<td>Advanced Calculus</td>
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<td>Introducing Engineering Design</td>
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<td>MAB413</td>
<td>Differential Equations</td>
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<td>Mathematics Elective (Level 2)</td>
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<td>ENB240</td>
<td>Introduction To Electronics</td>
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<td>ENB246</td>
<td>Engineering Problem Solving</td>
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<tr>
<td>MAB312</td>
<td>Linear Algebra</td>
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<td>MAB314</td>
<td>Statistical Modelling 2</td>
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<tr>
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<tbody>
<tr>
<td>ENB242</td>
<td>Introduction To Telecommunications</td>
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<tr>
<td>ENB243</td>
<td>Linear Circuits and Systems</td>
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<tr>
<td>ENB244</td>
<td>Microprocessors and Digital Systems</td>
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<td>Introduction To Design and Professional Practice</td>
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<tr>
<td>ENB241</td>
<td>Software Systems Design</td>
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<td>OR Electrical Engineering Selective</td>
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<tr>
<td>ENB301</td>
<td>Instrumentation and Control</td>
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<td>ENB340</td>
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<tr>
<td>ENB342</td>
<td>Signals, Systems and Transforms</td>
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<tr>
<td>ENB344</td>
<td>Industrial Electronics</td>
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<td>ENB345</td>
<td>Advanced Design and Professional Practice</td>
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<td>MAB414</td>
<td>Applied Statistics 2</td>
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<tr>
<td>BEB801</td>
<td>Project 1</td>
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<tr>
<td>ENB346</td>
<td>Digital Communications</td>
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<td>Mathematics Elective (Level 3)</td>
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<th>Year 5, Semester 2</th>
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<tr>
<td>BEB701</td>
<td>Work Integrated Learning 1</td>
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<tr>
<td>BEB802</td>
<td>Project 2</td>
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<tr>
<td>Electrical Engineering Selective</td>
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<td>Mathematics Elective (Level 3)</td>
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<th>Electrical Engineering Selectives</th>
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<td>ENB448</td>
<td>Signal Processing and Filtering</td>
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<td>Advanced Power Systems Analysis</td>
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<tr>
<td>MAB313</td>
<td>Mathematics of Finance</td>
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<tr>
<td>MAB420</td>
<td>Computational Mathematics 2</td>
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<tr>
<td>MAB422</td>
<td>Mathematical Modelling</td>
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<tr>
<td>MAB461</td>
<td>Discrete Mathematics</td>
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<tr>
<td>MAB480</td>
<td>Introduction to Scientific Computation</td>
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<tr>
<th>Mathematics Electives (Level 3)</th>
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<td>Four units required:</td>
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<tr>
<td>MAB521</td>
<td>Applied Mathematics 3</td>
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<tr>
<td>MAB522</td>
<td>Computational Mathematics 3</td>
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<tr>
<td>MAB524</td>
<td>Statistical Inference</td>
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<td>MAB533</td>
<td>Statistical Techniques</td>
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<tr>
<td>MAB536</td>
<td>Time Series Analysis</td>
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<tr>
<td>MAB613</td>
<td>Partial Differential Equations</td>
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<td>MAB623</td>
<td>Financial Mathematics</td>
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MAB624 Applied Statistics 3
MAB672 Advanced Mathematical Modelling

NOTES:
- 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.

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

UNIT SYNOPSISES

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; work place, health and safety; professional conduct; ethical responsibility, and other aspects of your work place experience. This unit may form part of your (compulsory) core course (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).

Prerequisites: 192cp of completed studies Credit points: 12 Campus: Gardens Point Teaching period: 2010 SEM-1, 2010 SEM-2 and 2010 SUM

BEB801 PROJECT 1
This unit is usually taken in the final year of study. Students complete an individual project involving the application of skills and knowledge attained during the earlier years of their degree program. For some students, this unit will be taken one of two 'project' units related to the same student project; in such cases this unit may be a pre-requisite or co-requisite to the second unit (or a follow-on from the first unit). The final 'deliverable' for this unit may vary for each discipline and details will be provided in lectures/tutorials and on the Blackboard website.

Equivalents: CEB411, CEB420, CNB434, EEB781-1, EEB889-1 Credit points: 12 Contact hours: 2 per week Campus: Gardens Point Teaching period: 2010 SEM-1 and 2010 SEM-2

BEB802 PROJECT 2
This unit is usually taken in the final year of study, and is only taken by students completing a two unit project. Students complete an individual project involving the application of skills and knowledge attained during the earlier years of their degree program. This unit will be taken as the second of two 'project' units related to the same student project.

Equivalents: CEB415, EEB782-2, EEB889-2 Credit points: 12 Contact hours: 2 Campus: Gardens Point
Teaching period: 2010 SEM-1 and 2010 SEM-2

ENB100 INTRODUCING PROFESSIONAL LEARNING
This unit will introduce students to a range of skills and knowledge sets required to support professional practice in engineering disciplines. It will include information literacy and communication skills and knowledge development. In addition, the unit will provide orientation to engineering 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.

Antirequisites: DEB100 and UDB100 Credit points: 12 Campus: Gardens Point

ENB110 ENGINEERING STATICS AND MATERIALS
Credit points: 12 Contact hours: 4 per week Campus: Gardens Point Teaching period: 2010 SEM-1 and 2010 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: 2010 SEM-1 and 2010 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 used in the description of system motion and the concepts of force and energy, conservation of momentum and conservation of energy are introduced and described. Thermodynamic processes, certain thermo-physical parameters and the first and second law of thermodynamics
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 baseband digital data communication techniques are studied using time and frequency domain analyses.  
Prerequisites: (ENB120 or ENB103) and (MAB126 or MAB110 or MAB111)  
Assumed knowledge: ENB240  
Credit points: 12  
Contact hours: 4 per week  
Campus: Gardens Point  
Teaching period: 2010 SEM-2

ENB220 INTRODUCING SUSTAINABILITY
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

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  
Assumed knowledge: ENB210  
Credit points: 12  
Contact hours: 5 per week  
Campus: Gardens Point  
Teaching period: 2010 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  
Assumed knowledge: ENB612  
Credit points: 12  
Contact hours: 4 per week  
Campus: Gardens Point  
Teaching period: 2010 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.  
Prerequisites: ENB240 and ENB246 or INB104  
Assumed knowledge: ENB240  
Credit points: 12  
Contact hours: 4 per week  
Campus: Gardens Point  
Teaching period: 2010 SEM-2

ENB246 ENGINEERING PROBLEM SOLVING
This unit introduces students to the use of computers as tools for solving engineering problems. MATLAB is
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:** 2010 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:** 2010 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:** 2010 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:** 2010 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:** EE8684  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 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: 2010 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: 2010 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: 2010 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: 2010 SEM-2

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: 2010 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 Credit points: 12 Contact hours: 4 per week Campus: Gardens Point Teaching period: 2010 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: 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.

Antirequisites: BSB123, EFB101, MAB141, MAN101 Assumed knowledge: Grade of at least Sound Achievement in Senior Mathematics B (or equivalent) or MAB105 is assumed knowledge. Credit points: 12 Contact hours: 4 per week Campus: Gardens Point Teaching period: 2010 SUM-2, 2010 SEM-1 and 2010 SEM-2

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 C (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 SEM-1, 2010 SEM-2 and 2010 SUM

### MAB210 STATISTICAL MODELLING 1

This unit includes: probability; independence; system reliability; using conditional probability in modelling; Bayes; introductory Markov chains; random variables and distributions; special distributional models; Bernoulli process; Poisson process; exponential; introductory queuing processes; expected values and moments; goodness-of-fit tests; measures of dependence; introductory bivariate and correlation properties; conditioning arguments.

**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-1 and 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

**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-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: MAB422
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

MAB443 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

MAB444 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

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

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
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 MAB413  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  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: MAB536, MAB526  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: MAN613  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2010 SEM-1

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; multistratum 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

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  Campus: Gardens Point  Teaching period: 2010 SEM-1