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

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.

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)

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
ENB130  Mechanical and Thermal Energy
MAB101  Statistical Data Analysis 1
MAB120  Algebra and Calculus

Year 1, Semester 2
ENB200  Introducing Engineering Systems
ENB120  Electrical Energy and Measurements
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)

Electrical Engineering Selectives
ENB339  Introduction to Robotics
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

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
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<tr>
<th>Year 1, Semester 2</th>
<th>ENB200</th>
<th>Introducing Engineering Systems</th>
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<td>ENB120</td>
<td>Electrical Energy and Measurements</td>
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<td>Statistical Modelling 2</td>
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<td>Introduction To Telecommunications</td>
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<td>Linear Circuits and Systems</td>
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<td>Mathematics Electives (Level 2)</td>
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<td>MAB313</td>
<td>Mathematics of Finance</td>
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<td>MAB420</td>
<td>Computational Mathematics 2</td>
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<td>MAB422</td>
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<td>MAB461</td>
<td>Discrete Mathematics</td>
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<td>MAB480</td>
<td>Introduction to Scientific Computation</td>
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<td>MAB315</td>
<td>Operations Research 2</td>
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<td>MAB521</td>
<td>Applied Mathematics 3</td>
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<td>MAB524</td>
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<td>MAB525</td>
<td>Operations Research 3A</td>
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<td>MAB533</td>
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<td>Time Series Analysis</td>
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<td>Partial Differential Equations</td>
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<td>MAB623</td>
<td>Financial Mathematics</td>
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<td>MAB624</td>
<td>Applied Statistics 3</td>
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<td>MAB625</td>
<td>Operations Research 3B</td>
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<td>MAB672</td>
<td>Advanced Mathematical Modelling</td>
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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.
Equivalent: PCB150
Credit points: 12
Contact hours: 4 per week
Campus: Gardens Point
Teaching period: 2011 SEM-1 and 2011 SEM-2

ENB100 ENGINEERING AND SUSTAINABILITY
This unit introduces you to the essential professional skills and practices of engineers in the context of sustainable development.
Antirequisites: DEB100 and UDB100
Credit points: 12
Contact hours: 3 per week
Campus: Gardens Point
Teaching period: 2011 SEM-1 and 2011 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-1 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 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 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.
Equivalent: 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: Gardens Point  Teaching period: 2011 SEM-2

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 baseband 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:** 4 per week  

**Campus:** Gardens Point  

**Teaching period:** 2011 SEM-1

**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 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: EEB684  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

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

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

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  
**Teaching period:** 2011 SUM-1, 2011 SEM-1 and 2011 SEM-2

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

**Antirequisites:** MAN120  
**Assumed knowledge:** Grade of at least Sound Achievement in Senior Mathematics B (or equivalent) or MAB105 is assumed knowledge  
**Equivalents:** MAB100, MAB125, MAB180  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1, 2011 SEM-2 and 2011 SUM

**MAB121 CALCULUS AND DIFFERENTIAL EQUATIONS**  
Building upon the foundations established in MAB120 or Senior Maths C, this unit addresses the significant role of mathematical modelling using differential equations for the description and resolution of simple and complex problems relevant to real world situations. The formulation and solution of such problems is supported by appropriate advanced mathematical concepts used for function approximation, differentiation and integration. Undertaking this unit will allow you to develop your problem solving skills, especially in the context of advanced mathematical techniques applied to 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 SEM-2 and 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 SEM-1 and 2011 SEM-2

**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 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: 2011 SEM-1

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 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) Antirequisites: MAN312 Credit points: 12 Contact hours: 4 per week Campus: Gardens Point Teaching period: 2011 SEM-1

MAB313 MATHEMATICS OF FINANCE
Finance provides one of the significant areas for the application of mathematics. Understanding the fundamental principles involved will enhance your general preparation for life and provide an essential tool for those of you who intend to pursue further studies or careers in the financial area. The aim of this unit is to provide you with an introduction to the methods used in obtaining relevant solutions to financial and business problems.
Prerequisites: MAB111 or MAB121 (which can be concurrently enrolled) Antirequisites: MAN313 Credit points: 12 Contact hours: 4 per week Campus: Gardens Point Teaching period: 2011 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: 2011 SEM-1

MAB315 OPERATIONS RESEARCH 2
This unit introduces the essential features of operations research methods. It develops a number of basic mathematical techniques to solve generic problems and the theoretical foundations of these techniques. Students should develop the ability to apply various operations research methods, algorithms and techniques in the solution of practical problems. Students will also look at the applications of operations research techniques to real-world problems.
Prerequisites: MAB210 and (MAB112 or MAB122)
Antirequisites: MAN315
Credit points: 12 Contact hours: 4 per week Campus: Gardens Point Teaching period: 2011 SEM-1

MAB413 DIFFERENTIAL EQUATIONS
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

MAB414 APPLIED STATISTICS 2
This unit includes: Simple linear regression (revision), multiple linear regression, making inferences from regressions, choosing a model, checking model assumptions, general linear models - analysis of covariance, ANOVA revisited, designing experiments, issues in designing experiments, analysing experimental results, further experimental designs, assumptions, and how to cope if they aren't met, simulations.
Prerequisites: MAB101 Assumed knowledge: MAB112
is recommended prior study Credit points: 12 Contact hours: 4 per week Campus: Gardens Point
Teaching period: 2011 SEM-2

MAB420 COMPUTATIONAL MATHEMATICS 2
This unit provides you with the opportunity to employ a number of the skills that you have developed in the disciplines of computational mathematics and linear algebra, combining them in a coherent manner for resolving topical and relevant real world problems. You will become familiar with the methodologies for developing numerical algorithms that can be employed for either the direct solution or the iterative solution of large, sparse linear systems.
MAB422 MATHEMATICAL MODELLING
In this unit you will develop skills in the formulation and interpretation of mathematical models of 'real-world' problems drawn from the literature, the media and the lecturer's own research areas. You will also develop and extend your skills in the use of mathematical software to investigate solutions of some of these models. By emphasizing the need to write clear mathematical arguments and to explain in logical and clear English the conclusions drawn from the mathematical models developed in the unit, you will also develop your written communication skills.

Prerequisites: MAB121 Antirequisites: MAN422
Assumed knowledge: MAB220 is recommended for prior/concurrent study for exposure to MATLAB

Credit points: 12 Contact hours: 4 per week Campus: Gardens Point Teaching period: 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: MAB312 Antirequisites: MAB112

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

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. Use of software Matlab and R.

Prerequisites: MAB314 Credit points: 12

Contact hours: 4 per week Campus: Gardens Point Teaching period: 2011 SEM-2

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.
MAB310 and MAB414  Antirequisites: MAB523  Credit points: 12  Contact hours: 4 per week  
Campus: Gardens Point  Teaching period: 2011 SEM-2

**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.

**Prerequisites:** MAB314 and MAB414  
**Antirequisites:** MAN536, MAB526  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

**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