Bachelor of Information Technology/Bachelor of Mathematics (IX29)

Year offered: 2010
Admissions: No
CRICOS code: 059226F
Course duration (full-time): 4 years
Domestic fees (indicative): 2010: CSP $2,655 (indicative) per semester
International Fees (indicative): 2010: $11,000 (indicative) per semester
QTAC code: 419552
Past rank cut-off: 76
Past OP cut-off: 12
OP Guarantee: Yes
Assumed knowledge: English (4,SA) and Maths B (4,SA)
Preparatory studies: For information on acquiring assumed knowledge visit http://www.studentservices.qut.edu.au/apply/ug/info/knowledge.jsp
Total credit points: 384
Course coordinator: Dr Gary Carter (Mathematics), Mr Richard Thomas (Information Systems)
Campus: Gardens Point

Course Update
From semester one, 2009 this course will not be available for commencing students. IX29 will only be available for continuing students. New students - please refer to IX57. Please contact enquiry.scitech@qut.edu.au for any enquiries.

Professional Recognition
On graduation, students will be eligible for membership of the Mathematical Society of Australia, the Statistical Society of Australia Inc and, depending on unit selection, the Australian Society for Operations Research. Graduates of the Bachelor of Information Technology meet the knowledge requirement for admission to the Australian Computer Society.

Course Design
This double degree comprises 384 credit points with 192 credit points from Information Technology and 192 credit points form Mathematics. All majors in the Bachelor of Information Technology are available.

Cooperative Education Program
The School of IT’s Cooperative Education Program gives you the opportunity of 10-12 months paid industry placement during your course where you can integrate real experience with what you’re learning in your degree. Students wishing to participate in the Cooperative Education Program should be aware that they will not receive financial support as a Dean’s Scholar for the duration of the placement.

Find out more about the Cooperative Education Program.

Mathematics Bursaries
Students enrolled in this course can apply for industry-sponsored bursaries. These bursaries are awarded to Australian citizens or permanent residents on a competitive basis. Applications should be submitted by 1 December of the year preceding entry to the course. For further information see www.maths.qut.edu.au

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.

Unit Incompatibility/Translation Information
Details on the translation and incompatibility of old and new units is located here: Undergraduate Translation Table
If you have completed the unit(s) listed under the “Translation Unit Codes” column you are not permitted to enrol in the listed new code.

Further Information
For further information about this course, please contact Gary Carter (Mathematics) or Mr Richard Thomas (Information Systems)
Phone: +61 7 3138 2782
Email: enquiry.scitech@qut.edu.au

Mathematics Units

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

Note: MAB311 Advanced Calculus and MAB312 Linear Algebra are mandatory units.

Level 3 Units - at least 4 units must be selected

MAB521 Applied Mathematics 3
MAB522 Computational Mathematics 3
MAB524 Statistical Inference
MAB525 Operations Research 3A
MAB533 Statistical Techniques
MAB536 Time Series Analysis
MAB613 Partial Differential Equations
MAB623 Financial Mathematics
MAB624 Applied Statistics 3
MAB625 Operations Research 3B
MAB640 Industry Project
MAB672 Advanced Mathematical Modelling
MAB681 Advanced Visualisation and Data Analysis

Note: MAB523 Introduction to Quality Management and MAB621 Discrete Mathematics do not contribute to the mandatory 48 credit points minimum from Level 3 Mathematics units.

Network Systems Major

Compulsory Units
INB350 Internet Protocols and Services
INB351 Computer Network Administration
INB352 Network Planning and Deployment
INB255 Security

Electives
INB312 Enterprise Systems Applications
INB365 Systems Programming
INB353 Wireless and Mobile Networks
INB355 Cryptology and Protocols

Software Architecture Major

Compulsory Units
INB340 Database Design
INB371 Data Structures and Algorithms
INB372 Agile Software Development

Electives
Choose 3 Electives
INB341 Software Development With Oracle
INB311 Enterprise Systems
INB312 Enterprise Systems Applications
INB272 Interaction Design
INB313 Electronic Commerce Site Development
INB322 Information Systems Consulting
INB320 Business Process Modelling
INB365 Systems Programming
INB370 Software Development
INB373 Web Application Development
INB374 Enterprise Software Architecture
INB381 Modelling and Animation Techniques
INB382 Real Time Rendering Techniques
INB383 Mathematics for Computer Graphics
INB384 Mathematics for Computer Graphics

Intelligent Systems Major (pre 2008)

Compulsory Units
INB335 Information Resources
INB342 Enterprise Data Mining
INB371 Data Structures and Algorithms
INB860 Computational Intelligence for Control and Embedded Systems

IT Elective (INB383 and INB343 recommended)

Course structure
This course has been discontinued. Currently enrolled students should check the Course Summary Sheet (via QUT Virtual) for enrolment and unit information.

Potential Careers:
Actuary, Computer Game Programmer, Data Communications Specialist, Database Manager, Market Research Manager, Mathematician, Network Administrator, Network Manager, Programmer, Quantitative Analyst, Software Engineer, Statistician, Systems Analyst.

UNIT SYNOPSES

INB255 SECURITY
This unit aims to give you an understanding of the major issues in information security. You will be able to identify critical information security concepts and determine the information security implications of interactions between entities. You will have knowledge of a range of techniques for protecting information, and understand the limitations of these techniques. You will be aware of international information security management standards.

Antirequisites: ITB161, ITB523, ITB623 and ITN161
Equivalents: ITB730  Credit points: 12  Contact hours: 3 per week  Campus: Gardens Point  Teaching period: 2010 SEM-1

INB272 INTERACTION DESIGN
The aim of this unit is to provide you with an understanding of the theory, practices and challenges associated with the development of creative interactive design and human computer interaction.

Prerequisites: INB103 or INB181  Equivalents: ITB254
Credit points: 12  Contact hours: 3 per week  Campus: Gardens Point  Teaching period: 2010 SEM-2

INB311 ENTERPRISE SYSTEMS
The unit presents and discusses the Enterprise Systems Lifecycle model, orienting students to the requirements of addressing total cost of ownership, change management requirements and process modelling requirements in order to achieve business benefits. Concepts of Enterprise Systems success and associated enablers and barriers are also introduced. This unit introduces the technical architecture of complex 3-tiered client server environments. It seeks to show how an integrated complex database environment meets common business needs, and yet fails to meet the total Information Systems requirements.

Credit points: 12  Contact hours: 3 per week  Campus: Gardens Point  Teaching period: 2010 SEM-2

INB312 ENTERPRISE SYSTEMS APPLICATIONS
The aim of this unit is to introduce one of the more complex and comprehensive Enterprise Systems applications. This unit introduces the business perspective and application processes of modules (such as FI, CO, PP, MM and S&D) and investigates the support provided by these systems and the integration between modules by following some of the major processes in a business. The unit enables you to experience both the business analyst view and the user's view of the system across a number of business processes.

Antirequisites: ITB233, INN312  Credit points: 12  Contact hours: 3 per week  Campus: Gardens Point  Teaching period: 2010 SEM-1

INB313 ELECTRONIC COMMERCE SITE DEVELOPMENT
This unit will enable you to specify, design, implement and maintain effective e-commerce applications. You will obtain a broad understanding of the potential of e-commerce and how it can be employed to benefit an organisation. You will get direct experience of creating an e-commerce storefront following a business to business (B to B) or business to consumer (B to C) model. You will also have an understanding of the computer systems that underpin e-commerce including payment systems and secure transactions.

Equivalents: ITB260  Credit points: 12  Contact hours: 3 per week  Campus: Gardens Point  Teaching period: 2010 SEM-2

INB320 BUSINESS PROCESS MODELLING
The aim of this unit is to introduce you to modern methods and tools of business process management. These skills will be applied to the most complex, comprehensive and relevant IT applications. This unit also seeks to develop logical thinking and the capability to understand and deal with complex systems, within a business management framework. The content will focus strongly on business process modelling, as a fundamental technique to manage the complexity associated with process management tasks within various contexts.

Equivalents: ITB298  Credit points: 12  Contact hours: 3 per week  Campus: Gardens Point  Teaching period: 2010 SEM-2

INB322 INFORMATION SYSTEMS CONSULTING
The aim of the unit is to develop your skills in the consulting engagement process. This unit will give you an appreciation of the management of consulting practices and an understanding of the consulting sector generally. This unit presents the tactical and strategic issues involved in
management consulting, and in particular: client engagement. In the unit there is an emphasis on Information Systems (IS) related work. IS constitutes a substantial portion of consulting activity and cuts across all areas of business expertise. The unit examines the dynamics of IS consulting within the context of large consulting firms and familiarises students with the consulting engagement lifecycle.

**Antirequisites:** ITB264, ITN264  
**Assumed knowledge:** Completion of 96 credit points of an Undergraduate study is assumed knowledge  
**Credit points:** 12  
**Contact hours:** 3 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-1

**INB335 INFORMATION RESOURCES**  
This unit will help you to understand the structure of the information environment, to reflect upon the information resources you discover, and to develop the ability to find appropriate information for future problem solving. You will develop your skills in identifying, accessing, evaluating and retrieving information resources to meet specific information needs. The unit will also help you develop skills in teamwork and oral and written communication.

**Equivalents:** ITB322  
**Credit points:** 12  
**Contact hours:** 3 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

**INB340 DATABASE DESIGN**  
The aim of this unit is to help you develop your knowledge, understand a formal specification tool (ORM) for modelling information systems unambiguously and to apply this formal technique to conceptualise information systems found in many real world application domains.

**Prerequisites:** INB210 or ITB004  
**Antirequisites:** ITB229  
**Credit points:** 12  
**Contact hours:** 3 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-1

**INB341 SOFTWARE DEVELOPMENT WITH ORACLE**  
Oracle Corporation is the leading supplier of database software. This unit aims to develop a sound understanding of database creation, installation, administration, management, security, back up/recovery and application development. The unit aims to develop practical skills in each of these elements, using appropriate Oracle software.

It is expected that students undertaking this unit will have prior knowledge of relational database terminology and concepts, be thoroughly able to develop SQL for querying, updating and creating tables, and have a sound knowledge of database design.

**Prerequisites:** INB210 or ITB004 or INB122  
**Equivalents:** ITB223  
**Credit points:** 12  
**Contact hours:** 3 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

**INB342 ENTERPRISE DATA MINING**  
This unit will provide a comprehensive theoretical coverage of various topics in data and web mining. In addition there will be a significant practical component using hands on tools to solve real-world problems. Specifically, we will consider techniques from machine learning, data mining, text mining, and information retrieval to extract useful knowledge from data which are used for business intelligence, document databases, site management, personalization, and user profiling. This unit will first cover a detailed overview of the mining process and techniques, and then concentrate on applications of these techniques to web, e-commerce, document databases and data from advanced applications.

**Prerequisites:** INB122 or INB210 or INB340 or AYB114  
**Antirequisites:** INN342  
**Equivalents:** ITB239  
**Credit points:** 12  
**Contact hours:** 3 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

**INB350 INTERNET PROTOCOLS AND SERVICES**  
An understanding of the theoretical and practical concepts of network protocols and services is highly useful and relevant to network engineers and others working in the Information Processing industries. This unit introduces you to Internet protocols and the design, implementation and operation of network based applications. Theory and practical skills taught in this unit will be useful if you intend undertaking further networking units.

**Prerequisites:** INB251 or ITB006 or ITB510  
**Antirequisites:** ITB264, ITB629, ITB720, ITN525, ITN667, ITN720  
**Credit points:** 12  
**Contact hours:** 3 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-1

**INB351 COMPUTER NETWORK ADMINISTRATION**  
The aim of this unit is to provide students with a working knowledge of the technical aspects and theory of network administration and management. The unit uses the Unix environment as the learning platform for attaining technical skills and for the development of problem solving skills necessary to be a successful networking professional.

**Prerequisites:** INB350  
**Equivalents:** ITB721, ITB625, ITB535, ITB525  
**Credit points:** 12  
**Contact hours:** 3 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2
INB352 NETWORK PLANNING AND DEPLOYMENT
The unit draws together subject matter from a number of different networking-related areas. The aim of the unit is to assemble the previously acquired knowledge and techniques and apply it in a cohesive fashion to the task of network planning.

Prerequisites: INB350  Antirequisites: ITB551, ITB628, ITB722, INN352, ITN551, ITN722  Credit points: 12
Contact hours: 3 per week  Campus: Gardens Point  Teaching period: 2010 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 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: 2010 SEM-1

INB355 CRYPTOLOGY AND PROTOCOLS
Cryptographic techniques are widely used to implement computer and network security. As an IT security professional you may be required either to evaluate or implement information systems using cryptographic algorithms and protocols. This elective unit covers the main cryptographic technical concepts including encryption, digital signatures and cryptographic protocols.

Antirequisites: ITB646, ITB548, ITB566  Assumed knowledge: Maths B or equivalent is assumed knowledge  Equivalents: ITB732
Credit points: 12  Contact hours: 3 per week  Campus: Gardens Point  Teaching period: 2010 SEM-1

INB365 SYSTEMS PROGRAMMING
Systems programming is an essential part of any computer-science education. This unit uses operating system concepts to teach the foundations of systems programming and advanced concepts for producing softwares that provide services to computer hardware. Through this study, you will be able to demonstrate knowledge of the principles and techniques of process management, memory and file management, protection & security, and distributed systems.

INB370 SOFTWARE DEVELOPMENT
Understanding software development is an integral part of the IT industry for software engineers. Software development relies on object technologies, programming techniques and numerous code libraries provided by language developers and third party vendors. Integrated Development Environments, unit testing frameworks, automated and continuous build tools and versioning systems are all becoming part of the tool set modern software developers must be familiar with. This unit is designed to introduce these technologies and techniques to show how software can be rapidly developed.

Prerequisites: INB270 or ITB003 or INN270  Credit points: 12  Contact hours: 3 per week  Campus: Gardens Point  Teaching period: 2010 SEM-1

INB371 DATA STRUCTURES AND ALGORITHMS
The purpose of this unit is to ensure that you have a sound knowledge of modern programming techniques and their use in providing medium-scale software solutions. This unit will teach you to decompose a problem and produce a modular solution to a programming task. The principles to analyse algorithms for efficiency will also be introduced. In addition, you will acquire the necessary skills for you to use the tools available in common development environments, such as Microsoft Visual Studio.

Prerequisites: INB270 or ITB003  Antirequisites: ITB711, ITB702, INN371
Credit points: 12  Contact hours: 3 per week  Campus: Gardens Point  Teaching period: 2010 SEM-1

INB372 AGILE SOFTWARE DEVELOPMENT
This unit introduces you to the software development process. You will look at each of the major activities involved in developing a software system. You will also learn how to manage and control the software development process for a large project when a number of team members are involved in the development. This unit develops the professional practice of working on large software systems.

Prerequisites: INB370  Antirequisites: INN372, ITB612, ITB712
Assumed knowledge: Good programming, debugging, testing and software development skills
Credit points: 12  Contact hours: 3 per week  Campus: Gardens Point  Teaching period: 2010 SEM-2
INB373 WEB APPLICATION DEVELOPMENT
This unit will provide you with an understanding of the issues, structure and technologies used for developing web-based systems. The unit will provide you with the theoretical and practical skills needed to develop enterprise critical applications designed with an n-tier architecture using state of the art technologies. A comparative technology approach is taken, including an analysis of how web technologies have evolved to date, in order to identify common themes and to better enable you to comprehend and critically evaluate future web technology offerings.
Prerequisites: INB271 or ITB007
Antirequisites: INN373
Equivalents: ITB716 and ITN716
Credit points: 12
Contact hours: 3 per week
Campus: Gardens Point
Teaching period: 2010 SEM-1

INB374 ENTERPRISE SOFTWARE ARCHITECTURE
This unit aims to introduce you to the field of enterprise architecture. It attempts to give you a grounding in the basic knowledge and skills required by an enterprise architect. This includes a solid understanding of the IT challenges currently facing medium to large size organizations, the theory and technologies currently used to address them and an appreciation of the business imperative for which they are utilized.
Prerequisites: INB270 or ITB003
Equivalents: ITB717
Credit points: 12
Contact hours: 3 per week
Campus: Gardens Point
Teaching period: 2010 SEM-2

INB381 MODELLING AND ANIMATION TECHNIQUES
The unit will provide you with the knowledge and skills to use an industry standard graphics API to implement graphics applications and to develop a basic real time animation system using an industry standard language.
Prerequisites: INB371 and MAB281
Equivalents: ITB746
Credit points: 12
Contact hours: 3 per week
Campus: Gardens Point
Teaching period: 2010 SEM-1 and 2010 SEM-2

INB382 REAL TIME RENDERING TECHNIQUES
This unit will provide you with knowledge and skills in basic to advanced techniques in real-time rendering using shading languages. You will be able to implement a high-quality real-time rendering system in an industry standard API.
Prerequisites: INB371, INB381 and MAB281
Antirequisites: ITB648 and ITB649
Equivalents: ITB747
Credit points: 12
Contact hours: 3 per week
Campus: Gardens Point
Teaching period: 2010 SEM-2

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.
Antirequisites: ITB847
Credit points: 12
Contact hours: 3 per week
Campus: Gardens Point
Teaching period: 2010 SEM-1

MAB281 MATHEMATICS FOR COMPUTER GRAPHICS
This unit introduces students to the mathematics involved in computer graphics, computer games and virtual reality. It is heavily reliant on analytic, Euclidean and projective geometries in 2D and 3D, elementary trigonometry, elementary linear algebra and elementary calculus. The unit will develop the mathematical concepts and where practicable show how these concepts are then applied in the field of computer graphics. Students must have completed four semesters of Senior Mathematics B with an exit level of Sound Achievement, or have passed MAB105 (or equivalent).
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 SEM-2

MAB311 ADVANCED CALCULUS
This unit covers the following: polar coordinates; parametric equations; conic sections; quadric surfaces; vector-valued functions; Fourier series; functions of several variables; graphs; partial derivatives; total derivatives; extrema; Lagrange multipliers; Taylor series for multivariable functions; double and triple integrals; Green's theorems; line and surface integrals; divergence theorem; Stoke's theorem; applications.
Prerequisites: (MAB111 or MAB121) and (MAB112 or MAB122)
Credit points: 12
Contact hours: 4 per week
Campus: Gardens Point
Teaching period: 2010 SEM-1

MAB312 LINEAR ALGEBRA
This unit covers the following broad topics from linear algebra: matrix analysis; eigenvalues and eigenvectors; vector spaces; inner product spaces.
Prerequisites: (MAB111 or MAB121) and (MAB112 or
MAB122) **Credit points:** 12  **Contact hours:** 4 per week  
**Campus:** Gardens Point  **Teaching period:** 2010 SEM-1

MAB313 MATHEMATICS OF FINANCE  
This unit includes: interest rates; solution of problems in compound interest; applications of annuities; valuation of securities; quantitative techniques in business and finance. Students need to concurrently enrol in MAB111 unless already completed.  
**Prerequisites:** MAB111 or MAB121  
**Antirequisites:** MAN313  
**Credit points:** 12  **Contact hours:** 4 per week  
**Campus:** Gardens Point  **Teaching period:** 2010 SEM-2

MAB314 STATISTICAL MODELLING  
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; queuing processes; long-term behaviour of processes; use of generating functions; bivariate and conditional distributions; transformations of random variables; beta and gamma distributions; mixture distributions; order statistics, minimum and maximum.  
**Prerequisites:** MAB112 and MAB210  
**Credit points:** 12  **Contact hours:** 4 per week  
**Campus:** Gardens Point  **Teaching period:** 2010 SEM-1

MAB315 OPERATIONS RESEARCH 2  
This unit introduces the essential features of operations research methods. It develops a number of basic mathematical techniques to solve generic problems and the theoretical foundations of these techniques. Students should develop the ability to apply various operations research methods, algorithms and techniques in the solution of practical problems. Students will also look at the applications of operations research techniques to real-world problems.  
**Prerequisites:** MAB210 and (MAB112 or MAB122)  
**Credit points:** 12  **Contact hours:** 4 per week  
**Campus:** Gardens Point  **Teaching period:** 2010 SEM-2

MAB317 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

MAB318 DISCRETE MATHEMATICS  
This unit includes: Simple linear regression (revision), multiple linear regression, making inferences from regressions, choosing a model, checking model assumptions, general linear models - analysis of covariance, ANOVA revisited, designing experiments, issues in designing experiments, analysing experimental results, further experimental designs, assumptions, and how to cope if they aren't met, simulations.  
**Prerequisites:** MAB101 and MAB111  
**Assumed knowledge:** MAB112 is recommended prior study  
**Credit points:** 12  **Contact hours:** 4 per week  
**Campus:** Gardens Point  **Teaching period:** 2010 SEM-2

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

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

MAB461 DISCRETE MATHEMATICS  
This unit has three basic components. They are combinatorics, abstract algebra and number theory. Combinatorics, which is about 60% of the unit, will largely consist of enumeration techniques in various settings. Abstract algebra (~20%) will advance the student’s knowledge of groups, rings and fields to include additive groups, multiplicative groups; polynomial rings, finite fields, isomorphisms, and homomorphisms. Number theory (~20%) will include methods of proof including induction and contradiction, modular arithmetic and congruence, gcd/lcm and theorems involving these, fundamental theorem of arithmetic, Fermat’s theorems, Euler’s theorem.  
**Prerequisites:** MAB112 or MAB122  
**Credit points:** 12  **Contact hours:** 4 per week  
**Campus:** Gardens Point  **Teaching period:** 2010 SEM-2
MAB480 INTRODUCTION TO SCIENTIFIC COMPUTATION
This unit teaches students how to implement a mathematical algorithm in a modern scientific computing environment (eg Matlab). A case-study approach is used with an emphasis on writing efficient code. Also an overview of other software packages used in mathematics will be given.

Prerequisite(s): MAB112 or MAB132 or MAB182
(Recommended: MAB210 or MAB220)  Credit points: 12
Contact hours: 4 per week  Campus: Gardens Point
Teaching period: 2009 SEM-2  Incompatible with: MAB380, ITB849

MAB481 VISUALISATION AND DATA ANALYSIS
This unit covers: history and evolution of data visualisation, definition of data visualisation, impact of data visualisation; fundamentals of computer graphics and modern day visualisation environments; visualisation of 2-D and 3-D data; general visualisation techniques including filtering: colour map transformations; contouring; height fields; coloured height fields; interpolation; Delauney triangulation; iso-surfaces; volume visualisation; probing; slicing; streamlines; streaklines and texture mapping; visualisation of multi-dimensional data; other data types such as finite element, vector, molecular and scatter data. Not offered after 2009.

Prerequisite(s): MAB101, MAB111, MAB480 or ITB003
(Highly Recommended: MAB112)  Credit points: 12
Contact hours: 4 per week  Campus: Gardens Point
Teaching period: 2009 SEM-1

MAB521 APPLIED MATHEMATICS 3
This unit includes: partial differential equations such as the wave, heat and Laplace equations; special functions(gamma, delta, Bessel and error functions, Legendre polynomials); vector analysis and applications (vector algebra, vector calculus, fields, grad, div, curl, line and surface integrals, divergence theorem, Stoke's theorem, applications); functions of a complex variable (analytic functions, contour integrals, Laurent series, residues).

Prerequisite(s): MAB311  Credit points: 12
Contact hours: 4 per week  Campus: Gardens Point
Teaching period: 2010 SEM-1

MAB522 COMPUTATIONAL MATHEMATICS 3
This unit includes: deriving the basic equations that describe fluid motion; the finite volume method for solving PDEs (application to the generalised diffusion equation, cell-centred and vertex-centred schemes, handling of boundary and initial conditions); solution of systems of nonlinear equations (Newton's method, Inexact Newton methods, Globally convergent methods).

Prerequisites: MAB311 and MAB420  Credit points: 12
Contact hours: 4 per week  Campus: Gardens Point
Teaching period: 2010 SEM-1

MAB524 STATISTICAL INFERENCE
This unit includes: maximum likelihood estimation, confidence intervals and hypothesis tests, introduction to Bayesian inference, prior and posterior distributions, Bayesian inference for binomial data, Poisson count data and normal data, simulation techniques for sampling from distributions. Use of software Matlab and R.

Prerequisites: MAB314  Credit points: 12
Contact hours: 4 per week  Campus: Gardens Point
Teaching period: 2010 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  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: MAN536, 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-2

**MAB623 FINANCIAL MATHEMATICS**

This unit includes the following: quantitative techniques in business, economics and finance; theory and structure of interest rates; general accumulation and discounting functions; force of interest; discounting including Modern Portfolio theory and extension; varying interest; general annuities; varying annuities; continuous varying annuities; mathematical analysis of financial transactions in money and capital markets; life annuities and life assurances; the life table; basic life table functions; life annuities and assurances; policy values; paid up policy values; changes to policies; use of life table; superannuation.

**Prerequisites:** MAB313 and MAB311

**Credit points:** 12

**Contact hours:** 4 per week

**Campus:** Gardens Point

**Teaching period:** 2010 SEM-2

**MAB624 APPLIED STATISTICS 3**

This unit includes the following: design of experiments for factorial investigations (two and three-level factors, Taguchi’s approach, fractions and blocking, response surfaces); general linear model; regression graphics; multi-stratum designs and analysis; repeated measures designs and analysis; linear-logistic and log-linear models; use of statistical software.

**Prerequisites:** MAB414

**Antirequisites:** MAN624

**Credit points:** 12

**Contact hours:** 4 per week

**Campus:** Gardens Point

**Teaching period:** 2010 SEM-2

**MAB625 OPERATIONS RESEARCH 3B**

This unit includes: phases of an operations research study; decision analysis; queuing theory; simulation; implementation in operations research; heuristic techniques.

**Prerequisites:** MAB315

**Credit points:** 12

**Contact hours:** 4 per week

**Campus:** Gardens Point

**Teaching period:** 2010 SEM-2

**MAB640 INDUSTRY PROJECT**

For this unit, you will usually work in industry part-time. You will be assisted to develop a suitable plan to manage the project. You are expected to record progress and subsequently develop an accurate report.

**Other requisites:** Unit coordinator approval is required to enrol

**Credit points:** 24

**Campus:** Gardens Point

**Teaching period:** 2010 SEM-1 and 2010 SEM-2

**MAB672 ADVANCED MATHEMATICAL MODELLING**

Models are developed beginning with the description of 'real world' problems. Emphasis is on the mathematical modelling and not on the development of new mathematical techniques. The unit includes: mathematical modelling; model formulation; dimensional analysis and re-scaling; curves of pursuit; bungy jumping; modelling with systems of ordinary differential equations; phase plane methods for analysing systems of ODEs; bacterial growth in a chemostat; predator-prey models with harvesting; limit cycles; oscillations and excitable media; modelling with partial differential equations; motion of a continuum; continuity; traffic flow; aggregation of slime mould amoebae; momentum; ideal gas dynamics; quasi-linear PDEs.

**Prerequisites:** MAB422 and MAB312

**Antirequisites:** MAN672

**Credit points:** 12

**Contact hours:** 4 per week

**Campus:** Gardens Point

**Teaching period:** 2010 SEM-1