Bachelor of Mathematics (MA54)

Year offered: 2010
Admissions: Yes
CRICOS code: 049433D
Course duration (full-time): 3 Years
Course duration (part-time): 6 Years
Domestic fees (indicative): 2010: CSP $2,310 (indicative) per semester
International Fees (indicative): 2010: $11,000 (indicative) per semester
Domestic Entry: February and July
International Entry: February and July
QTAC code: 418701
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: 288
Standard credit points per full-time semester: 48
Standard credit points per part-time semester: 24
Course coordinator: Dr Glenn Fulford
Discipline coordinator: Dr Dann Mallet
Campus: Gardens Point

Career Opportunities
Mathematics graduates are employed across a wide range of areas. These include, but are not limited to, finance, investment, information technology, environmental management, health, marketing, logistics, defence, media, education and research. In addition to their knowledge and skills in mathematics, graduates are also highly valued for their analytical and problem-solving skills. Development of skills in communication, problem-solving, critical thinking and teamwork form an integral part of the course.

Favourable career outcomes for Bachelor of Mathematics graduates are likely due to the current demand for qualified statisticians and mathematicians.

Recommended Study
Maths C is recommended.

Course Design
The course structure is flexible in nature so that you can choose to study only mathematics units or include some units from another area of interest, such as science, business or information technology.

In the first year you will study core units in mathematics and statistics. These core units include studies in calculus, algebra, vectors and matrices, computational mathematics, data analysis and statistical modelling.

You will be able to design your program to suit your interests and career aspirations by combining advanced units from a number of the following areas of specialisation:

Applied Mathematics
Mathematical techniques that can be used to solve real-world problems.

Computational Mathematics
Computers and numerical techniques used to find solutions to complex problems which cannot be solved analytically.

Discrete Mathematics
The mathematics of numbers, including study of sets, fields, ring and groups.

Financial Mathematics
A wide variety of mathematical techniques used in applications within the financial area.

Mathematical Modelling
The utilisation of mathematical techniques to develop a model or explanation of a real-world problem which can then be tested.

Operations Research
Optimising complex systems including queuing, scheduling or allocation of resources.

Scientific Computation and Visualisation
Supercomputing, large-scale scientific modelling and creating graphical representations using visualisation techniques.

Statistics
Collecting data in an appropriate format, experimental design, analysis of data and using data to make predictions.

Statistical Modelling
Building and analysing models of systems involving probability and variables.

Professional Recognition
Membership of the Australian Mathematical Society, the Statistical Society of Australia Inc and the Australian Society for Operations Research is available.

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.

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

Course Coordinator
Dr Glenn Fulford
Phone: +61 7 3138 5196
Email: sms.ma54coord@qut.edu.au

Course structure - Bachelor of Mathematics

Students complete at least 192 credit points (16 twelve credit point units) of Mathematics units according to the following requirements:

Level 1 Mathematics Units

Students must complete the following Level 1 Mathematics units:

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

Note: MAB120 is for students who do not have an exit assessment of at least Sound Achievement in four semesters of both Senior Mathematics B and Senior Mathematics C

Level 2 and 3 Mathematics Units

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

Students must complete:

MAB311 Advanced Calculus
MAB312 Linear Algebra

Other Units

Up to a maximum of 96 credit points may be taken as electives with not more than 48 credit points from first level units.

Note: A first level unit is classified as a unit that is normally taken in the first year of a single degree. Examples of first level units are BSB1xx, INB101-INB104, SCB1xx units, PQB2xx units. Please check with your Course Coordinator if you would like to take language units or units from faculties other than Business, Information Technology or Science so that you can be advised on the correct unit(s) in which to enrol.

Suggested Program for February Entry

STUDENTS WITH AN EXIT ASSESSMENT OF AT LEAST SOUND ACHIEVEMENT IN BOTH SENIOR MATHEMATICS B AND SENIOR MATHEMATICS C (OR EQUIVALENT)

Year 1, Semester 1

MAB101 Statistical Data Analysis 1
MAB121 Calculus and Differential Equations
MAB122 Algebra and Analytic Geometry
ONE additional unit from:
BSB110 Accounting
MAB220 Computational Mathematics 1
SCB110 Science Concepts and Global Systems
Other first level unit (see below and later in document for other suggestions)

Year 1, Semester 2

MAB210 Statistical Modelling 1
THREE additional units from:
MAB220 Computational Mathematics 1
MAB281 Mathematics for Computer Graphics
MAB313 Mathematics of Finance
MAB422 Mathematical Modelling
MAB480 Introduction to Scientific Computation
BSB113 Economics
### Mathematics Units

**Level 1 Mathematics Units**

- MAB101 Statistical Data Analysis 1
- MAB120 Algebra and Calculus
  - TWO additional units from:
    - BSB110 Accounting
    - BSB113 Economics
    - SCB110 Science Concepts and Global Systems
    - SCB111 Chemistry 1
    - SCB112 Cellular Basis of Life
      - Other first level elective unit (see later in document for other suggestions)

**Level 2 Mathematics Units**

- MAB311 Advanced Calculus
- MAB312 Linear Algebra
  - TWO additional units from mathematics units or elective units

**Level 3 Mathematics Units**

- MAB521 Applied Mathematics 3

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### Year 1, Semester 1

- MAB101 Statistical Data Analysis 1
- MAB120 Algebra and Calculus
  - TWO additional units from:
    - BSB110 Accounting
    - BSB113 Economics
    - SCB110 Science Concepts and Global Systems
    - SCB111 Chemistry 1
    - SCB112 Cellular Basis of Life
      - Other first level elective unit (see later in document for other suggestions)

### Year 2, Semester 1

- MAB311 Advanced Calculus
- MAB312 Linear Algebra
  - TWO additional units from mathematics units or elective units

### Year 2, Semester 2

- FOUR units from mathematics units or elective units (see course structure)

### Year 3, Semester 1

- FOUR units from mathematics units or elective units (see course structure)

### Year 3, Semester 2

- FOUR units from mathematics units or elective units (see course structure)

### Mathematics Units

**Students should not enrol in Mathematics units other than those listed below:**

**Level 1 Mathematics Units**

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

**Level 2 Mathematics 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

**Level 3 Mathematics Units**

- MABS21 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

Other Units
Up to a maximum of 96 credit points (8 twelve credit point units) can be taken from other units, with not more than 48 credit points (4 twelve credit point units) from first level units. A first level unit is classified as a unit that is normally taken in the first year of a single degree.

OTHER UNIT - FIRST LEVEL: This unit can only be taken in MA54 after recommendation from the Course Coordinator. This unit cannot be included in the minimum of 16 mathematics units required for the course.

MAB105 Preparatory Mathematics

OTHER UNIT - ADVANCED LEVEL: This unit cannot be included in the minimum of 16 mathematics units required for the course, but can be counted as an elective.

MAB281 Mathematics for Computer Graphics

Potential Careers:
Actuary, Computer Game Programmer, Market Research Manager, Mathematician, Quantitative Analyst, Statistician.

UNIT SYNOPSIS

BSB110 ACCOUNTING
Accounting data is the basis for decision making in any organisation. Accordingly, the aim of this unit is to provide students with a basic level of knowledge of modern financial and managerial accounting theory and practice so that they can understand how accounting data is used to help make decisions in organisations. The unit covers financial procedures and reporting for business entities, analysis and interpretation of financial statements and planning, control and business decision making.

Antirequisites: BSD110, CNB293, UDB342
Equivalents: CTB110
Credit points: 12
Contact hours: 3 per week
Campus: Gardens Point and Caboolture
Teaching period: 2010 SEM-1, 2010 SEM-2 and 2010 SUM

BSB113 ECONOMICS
This unit introduces students to the key economic concepts and their practical applications. It comprises twelve topics each focusing on a current economic issue. Microeconomic topics include demand and supply, elasticity, production and cost theory and market structure. Macroeconomic topics include measuring GDP, inflation and unemployment, money and banking, and fiscal and monetary policy.

Antirequisites: BSD113
Equivalents: CTB113
Credit points: 12
Contact hours: 3 per week
Campus: Gardens Point and Caboolture
Teaching period: 2010 SEM-1, 2010 SEM-2 and 2010 SUM

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

MAB105 PREPARATORY MATHEMATICS
This unit is a substitute for Senior Mathematics B for those students who need the equivalent background for the successful study of units which assume it. It includes: basic number facts, natural numbers, integers, rational numbers, real numbers and their operations; basic algebra; functions and equations, graphs, linear functions, equations and applications; systems of linear equations; quadratic, exponential, logarithmic and trigonometric functions, properties and applications; introduction to calculus; rates of change, derivatives, rules of differentiation, second derivatives, maxima and minima and applications; integration and applications. This unit is incompatible with an exit assessment of High Achievement or better in Senior Mathematics B.

Assumed knowledge: Year 10 Level 6 Mathematics is assumed knowledge.

Credit points: 12
Contact hours: 4 per week
Campus: Gardens Point
Teaching period: 2010 SEM-1 and 2010 SEM-2
MAB120 ALGEBRA AND CALCULUS
This unit introduces and reviews the elementary concepts of function, calculus, matrices and vectors with special reference to applications in science, technology and business where appropriate. Topics covered include the algebra of complex numbers, elementary functions (polynomial, trigonometric, exponential and logarithmic) and their properties, differentiation and integration methods and principles, geometric and algebraic applications of vectors and the solution of linear systems using matrices.

Assumed knowledge: Grade of at least Sound Achievement in Senior Mathematics B (or equivalent) or MAB105 is assumed knowledge  
Equivalents: MAB100, MAB125, MAB180  
Credit points: 12  
Contact hours: 4 per week  
Campus: Gardens Point  
Teaching period: 2010 SEM-1, 2010 SEM-2 and 2010 SUM

MAB121 CALCULUS AND DIFFERENTIAL EQUATIONS
This unit extends the areas of function and calculus introduced in MAB120 by introducing series representations for functions and more advanced methods of differentiation and integration for functions of one variable. A strong connection to real world problems is made by introducing the use of differential equations in modelling, and exploring appropriate methods of solution. Practical calculations of volumes and surface areas of solids of revolution extend your interpretations of the definite integral. Taylor and Fourier series are introduced as a means of approximating functions by sums of polynomials and periodic functions. Some more advanced methods for indefinite integrals, such as partial fraction decomposition, are also introduced.

Assumed knowledge: Grade of at least Sound Achievement in Senior Mathematics C (or equivalent) or MAB125 or MAB180 or MAB120 is assumed knowledge  
Equivalents: MAB111, MAB126  
Credit points: 12  
Contact hours: 4 per week  
Campus: Gardens Point  
Teaching period: 2010 SEM-1, 2010 SEM-2 and 2010 SUM

MAB122 ALGEBRA AND ANALYTIC GEOMETRY
This unit extends your knowledge in the areas of functions, calculus, matrices and vectors introduced in MAB120 by introducing functions of more than one variable, partial derivatives and multiple integrals, vector valued functions, and matrix methods for the solution of large systems of linear equations.

Equivalents: MAB112, MAB127, MAB132  
Credit points: 12  
Contact hours: 4 per week  
Campus: Gardens Point  
Teaching period: 2010 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

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

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

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

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

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

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

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

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

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

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

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

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

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

**Prerequisites:** MAB101 and MAB111  
**Assumed knowledge:** MAB112 is recommended prior study  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

**MAB420 COMPUTATIONAL MATHEMATICS 2**
This unit includes: direct methods for systems of linear equations; solution methods for special matrix systems (banded matrix systems, block-banded matrix systems, data structures and algorithms for storing and manipulating sparse matrices, reordering schemes); vector and matrix norms (basic theory and definitions, error bounds for direct methods, condition numbers); iterative methods for systems of linear equations (Jacobi, Gauss-Siedel, Successive Over-Relaxation, conjugate gradient); iterative methods for the eigenvalue problem.

**Prerequisites:** MAB220 and MAB312  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

**MAB422 MATHEMATICAL MODELLING**
This unit includes models developed with the "real world" description. These models are taken from the areas of cancer research, population growth and engineering. Emphasis is on mathematical modelling and not on the development of new mathematical content.

**Prerequisites:** MAB121  
**Antirequisites:** MAN422  
**Assumed knowledge:** MAB220 is recommended for prior/concurrent study for exposure to MATLAB  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2010 SEM-2

**MAB461 DISCRETE MATHEMATICS**
This unit has three basic components. They are combinatorics, abstract algebra and number theory. Combinatorics, which is about 60% of the unit, will largely
consist of enumeration techniques in 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 (e.g., 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  
**Teaching period:** 2010 SEM-2

### MAB521 APPLIED 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; non-stationary processes; seasonal ARIMA models; vector autoregression; long-range dependence and fractional ARIMA models; co-integration of non-stationary 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-logicist 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

PQB250 MECHANICS AND ELECTROMAGNETISM
The experimental means by which we have arrived at our modern understanding of the universe is central to the scientific philosophy. Students of physics and physics related areas need to possess skills in quantitative handling, processing, communication and evaluation of data. Higher level studies in specialised areas of Physics require a familiarity with a range of fundamental topics in Physics and an ability to apply critical thinking and advanced mathematical techniques to the analysis and solution of Physical problems. This first-level unit lays the foundation for these higher level studies by introducing the fundamental topic areas of mechanics and electromagnetism. 
Assumed knowledge: Senior Maths B is assumed knowledge.  
Credit points: 12  
Contact hours: 4.5 per week  
Campus: Gardens Point  
Teaching period: 2010 SEM-2

PQB251 WAVES AND OPTICS
Wave phenomena are used to describe and explain many of the physical processes in the universe. Sound and light are the most commonly experienced of these and have far-reaching human applications, including their use as experimental tools for science. The study of wave phenomena has led to the development of quantum mechanics, a cornerstone of modern scientific thought. This first-level unit lays the foundation for discussion of wave phenomena in higher level studies, but will also be relevant to those not considering progressing to a Physics major but wishing to understand more of the Physical world in which we live. 
Assumed knowledge: Senior Maths B is assumed knowledge.  
Credit points: 12  
Contact hours: 4.5 hours per week  
Campus: Gardens Point  
Teaching period: 2010 SEM-2
period: 2010 SEM-2

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

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

period: 2010 SEM-1 and 2010 SEM-2

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

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

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

Antirequisites: LSB118  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching