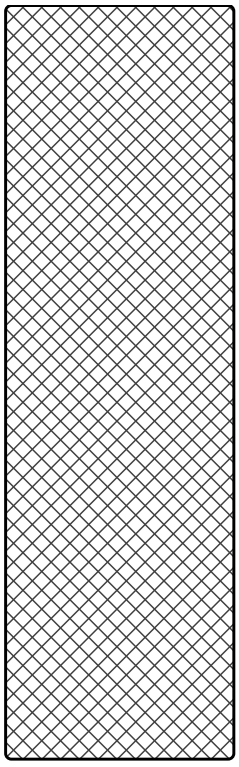
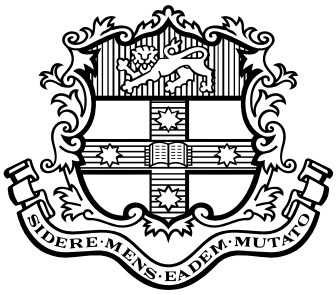


School of Mathematics
and Statistics

Faculties of Arts
Economics, Education
and Science

INTERMEDIATE MATHEMATICS and STATISTICS



2005

THE UNIVERSITY OF SYDNEY

Contents

1. Introduction

This handbook contains information about Intermediate Units of Study offered by the School of Mathematics and Statistics, for students in the Faculties of Science, Arts, Engineering, Economics and Education. If you enrol in an intermediate mathematics or statistics unit you will need to refer to this handbook throughout the year.

This introductory section aims to provide you with sufficient information to be able to choose the units which most suit your interests and abilities.

The School offers a variety of one-semester 6-credit point intermediate units in Mathematics and Statistics. There are units at both Advanced and Normal levels. Mathematics units are grouped into two disciplines, Applied Mathematics and Pure Mathematics.

If you are a student in the Science Faculty you are required to complete a major in a recognized subject area (such as Mathematics or Statistics). For this you must complete at least 24 senior credit points in that subject area. You can, if you wish, attempt two majors. You should keep this in mind when planning your intermediate year and consult the Senior Mathematics and Statistics Handbook and Science Faculty handbook, if necessary. The School of Mathematics and Statistics offers majors in the following subject areas: Mathematics, which includes a double major in Mathematics consisting of at least 48 senior credit points; Statistics; and Financial Mathematics and Statistics. Although it is possible for you to do a major in Mathematics with only 12 intermediate level credit points of Mathematics, you are strongly advised to do more than 12 credit points of Intermediate Mathematics. Completing 18 or 24 credit points of intermediate level Mathematics will provide you with a better foundation for your senior year, and open up a wider choice of senior level units to you. If your main interest is Mathematics, you could well choose to do a double major in Mathematics, and the ideal preparation for this would be 36 credit points of intermediate level Mathematics. You may, if you wish, specialize completely in Mathematics and Statistics in your intermediate and senior years.

If you are in a Faculty different from Science consult the relevant Faculty handbook about your degree requirements in Mathematics and Statistics. Engineering students should also consult their department.

The School offers honours units in Applied Mathematics, Pure Mathematics and Mathematical Statistics. If you are considering an honours degree in Mathematics and Statistics, most of your units should be at the advanced level.

A brief description of each of the units of study, and recommended combinations of units, follows. You may, of course, choose any combination of units

for which you qualify. Prerequisites for each unit are given in Chapter 2. However, you should follow the recommendations if you wish to major in, or complete an honours degree in, one of the subject areas described below.

1.1. Pure Mathematics

Pure Mathematics units are designed to provide students with the mathematical knowledge and techniques necessary in all scientific and engineering disciplines, as well as the solid mathematical base necessary for a career in mathematics. Recent developments in pure mathematical research have led to important and exciting applications in various branches of theoretical and applied sciences, and in engineering. Some examples include the application of singularity theory and group theory to symmetry-breaking and bifurcation in engineering; the application of number theory to cryptography; of category theory to computer science; and of complex analysis and algebraic geometry to physics.

Most importantly, units in Pure Mathematics provide invaluable training in logical thinking and problem solving – skills which you will find invaluable no matter what career you subsequently choose. Graduates with a major in Pure Mathematics may choose a career in teaching or research, or in one of the many fields in which mathematical ability and expertise are important, such as finance, operations research, computing and management. Even if your intended career path does not seem to involve much mathematics, you will find that employers, in general, hold mathematical ability in very high regard.

If your interest is in Pure Mathematics, the following units are recommended.

Normal Level There are four 6 credit point intermediate units recommended for students of Pure Mathematics:

MATH2061 *Linear Mathematics and Vector Calculus*.

MATH2065 *Introduction to Partial Differential Equations*.

MATH2068 *Number Theory and Cryptography*.

MATH2069 *Discrete Mathematics and Graph Theory*.

We recommend that all students wishing to complete a Mathematics major in Pure Mathematics do at least one analysis course and one algebra course. A 12 credit point normal level combination of units will allow you to do this, but you are strongly advised to do more than 12 credit points of Intermediate Mathematics. If your grades have been a credit average or better in Junior Mathematics units we encourage you enrol in some advanced units in second year.

Advanced Level There are four advanced level Pure Mathematics units. Serious students of Pure Mathematics are strongly encouraged to enrol in at least three of these.

MATH2961 *Linear Mathematics and Vector Calculus (Advanced).*

MATH2962 *Real and Complex Analysis (Advanced).*

MATH2968 *Algebra (Advanced).*

MATH2969 *Discrete Mathematics and Graph Theory (Advanced).*

This advanced level package of units will allow you to do a Mathematics major in Pure Mathematics and proceed to an honours year in Pure Mathematics. It is not strictly necessary to take all units at the advanced level in order to do honours, but you will find that each unit contains important background material needed for advanced third year and honours courses.

1.2. Applied Mathematics

Applied Mathematics is concerned with the development of mathematical models and techniques, both classical (e.g., calculus) and modern (e.g., discrete optimisation), with application to the solution of problems in the physical, biological and social sciences, engineering, medicine and computer science. The School has particular expertise in the general fields of astrophysics, relativity, engineering mathematics, biological sciences and earth sciences. Computer algebra and computational techniques are of considerable interest to Applied Mathematics and units are offered reflecting this.

Units in Applied Mathematics give a student a broad but rigorous training. These qualities are much in demand in the computer industry, engineering, banking and commerce, government organisations and teaching, and thus the study of Applied Mathematics can lead to a rewarding and satisfying career in a wide variety of disciplines. Applied Mathematics is complementary to units in Physics, Marine Sciences and Geophysics. For the mathematically inclined student the combination of Applied Mathematics with one or both of Pure Mathematics and Mathematical Statistics is an obvious possibility.

If your interest is in Applied Mathematics, the following units are recommended.

Normal Level There are four 6 credit point intermediate units recommended for students of Applied Mathematics:

MATH2061 *Linear Mathematics and Vector Calculus.*

MATH2065 *Introduction to Partial Differential Equations.*

MATH2063 *Mathematical Computing and Nonlinear Systems.*

MATH2070 *Optimisation and Financial Mathematics.*

We recommend that all students wishing to major in Applied Mathematics do MATH2061 and MATH2065. A 12 credit point normal level combination of units of units will allow you to complete a Mathematics major in Applied Mathematics, but you are strongly advised to do more than 12 credit points of Intermediate Mathematics. You may, if you wish, enrol in some advanced units, provided you qualify.

Advanced Level There are four advanced units of Applied Mathematics. Serious students of Applied Mathematics are strongly encouraged to enrol in the two units:

MATH2961 *Linear Mathematics and Vector Calculus (Advanced).*

MATH2965 *Introduction to Partial Differential Equations (Advanced).*

and at least one of the following units:

MATH2963 *Mathematical Computing and Nonlinear Systems (Advanced).*

MATH2970 *Optimisation and Financial Mathematics (Advanced).*

This advanced level package of units will allow you to complete a Mathematics major in Applied Mathematics and proceed to an honours year in Applied Mathematics. It is not strictly necessary to take all units at the advanced level in order to do honours, but they do provide a better foundation for senior units and honours.

1.3. Statistics

Mathematical Statistics is concerned with developing the theory necessary for the analysis and modelling of data and the testing of scientific hypotheses. Statistical ideas permeate the whole fabric of scientific investigation. Thus the units are found valuable not just for mathematicians but for students specialising in areas such as psychology and biological sciences.

Statistical expertise is a valued commodity in industry, commerce and government agencies. Thus recent graduates with a major in mathematical statistics have had no difficulty in finding employment either in the private sector (e.g., insurance, banking) or the public sector (e.g., ABS, CSIRO, SRA, Telstra). There is at present an Australia-wide shortage of honours graduates and postgraduates in statistics.

Modern statistics involves considerable use of high-speed computers. Students in the intermediate Statistics units, STAT2011 or STAT2911 and STAT2012 or STAT2912, will have weekly computing sessions using the package S-Plus.

Normal Level The standard 12 credit point Statistics intermediate combination of units is as follows:

STAT2011 *Statistical Models.*

STAT2012 *Statistical Tests*.

In order to major in Statistics, it is recommended that you take MATH2061 (or MATH2961).

Advanced Level The standard 12 credit point Statistics intermediate combination of units is as follows:

STAT2911 *Probability and Statistical Models (Advanced)*.

STAT2912 *Statistical Tests (Advanced)*.

In order to major in Statistics at the Advanced level, you must take the units MATH2061 (or MATH2961).

Science students who do not wish to major in Statistics, but want to learn further statistical techniques, without the mathematical theory, could choose STAT2012, following any Junior Statistics course. These students can then proceed to up to 12 credit points of Senior Statistics if they wish.

1.4. Financial Mathematics and Statistics

Students in the BSc and BSc (Advanced) degrees can choose to major in Financial Mathematics and Statistics. For this you must complete the core intermediate units of study listed below.

Normal Level The core 18 credit point combination of intermediate normal units in Financial Mathematics and Statistics is:

MATH2070 *Optimisation and Financial Mathematics*.

STAT2011 *Statistical Models*.

STAT2012 *Statistical Tests*.

Advanced Level The core 18 credit point combination of intermediate advanced units in Financial Mathematics and Statistics is:

MATH2970 *Optimisation and Financial Mathematics (Advanced)*.

STAT2911 *Probability and Statistical Models (Advanced)*.

STAT2912 *Statistical Tests (Advanced)*.

It is recommended that you also do the following Intermediate Mathematics units: (MATH2061 or MATH2961), (MATH2063 or MATH2963) and (MATH2065 or MATH2965).

1.5. Prohibitions between New and Superseded Units

Students affected by any of the following prohibitions between new units of study and units of study which have been superseded should contact an appropriate course coordinator. See Chapter 6.

- MATH2061 Linear Mathematics and Vector Calculus may not be counted with MATH2001 or MATH2901 or MATH2002 or MATH2902.
- MATH2063 Mathematical Computing and Nonlinear Systems may not be counted with MATH2003 or MATH2903 or MATH2006 or MATH2906.
- MATH2065 Introduction to Partial Differential Equations may not be counted with MATH2005 or MATH2905.
- MATH2067 Differential Equations and Vector Calculus for Engineers may not be counted with MATH2001 or MATH2901 or MATH2005 or MATH2905.
- MATH2068 Number Theory and Cryptography may not be counted with MATH3024 or MATH3009.
- MATH2069 Discrete Maths and Graph Theory may not be counted with MATH2011 or MATH2009.
- MATH2070 Optimisation and Financial Mathematics may not be counted with with MATH2010 or MATH2033 or MATH2933.
- MATH2961 Linear Algebra and Vector Calculus (Advanced) may not be counted with MATH2001 or MATH2901 or MATH2002 or MATH2902.
- MATH2963 Mathematical Computing and Nonlinear Systems (Adv.) may not be counted with MATH2003 or MATH2903 or MATH2006 or MATH2906.
- MATH2965 Introduction to Partial Differential Equations (Advanced) may not be counted with MATH2005 or MATH2905.
- MATH2962 Real and Complex Analysis (Advanced) may not be counted with MATH2007 or MATH2907.
- MATH2968 Algebra (Advanced) may not be counted with MATH2908 or MATH2918 or MATH2008.
- MATH2969 Discrete Maths and Graph Theory (Advanced) may not be counted with MATH2011 or MATH2009.
- MATH2970 Optimisation and Financial Mathematics (Advanced) may not be counted with MATH2010 or MATH2033 or MATH2933.
- STAT2011 Statistical Models may not be counted with STAT2001 or STAT2901.
- STAT2012 Statistical Tests may not be counted with STAT2004.
- STAT2911 Probability and Statistical Models (Advanced) may not be counted with STAT2001 or STAT2901.
- STAT2912 Statistical Tests (Advanced) may not be counted with STAT2004.

1.6. Progression to Senior Units

- In general, you need 12 credit points of intermediate Mathematics to qualify for a normal level unit of senior Mathematics.

- If your major interest is in pure or applied Mathematics, then you are strongly encouraged to enrol in 6 units (36 credit points) of intermediate Mathematics. If you are considering doing honours in Mathematics, the units should include the core advanced units.
- Students intending to specialise in Applied Mathematics should choose at least 3 units (18 credit points) from the units labelled "Applied" or "Pure and Applied". The units should include (MATH2061 or MATH2961) and (MATH2065 or MATH2965).
- Students intending to specialise in Pure Mathematics should choose at least 3 units (18 credit points) from the units labelled "Pure" or "Pure and Applied". These should include (MATH2061 or MATH2961).
- Computer Science students should normally include MATH2069 and STAT2012, among their choices, and strongly consider MATH2068.
- Physics students would be well-advised to choose (MATH2061 or MATH2961) and (MATH2065 or MATH2965).
- Prospective teachers of mathematics should consider (MATH2061 or MATH2961), (MATH2063 or MATH2963), MATH2962, and (STAT2011 or STAT2911). The unit MATH2069 is also recommended.

2. Units of Study

- Each unit has a web page, accessed by following the links from

  `http://www.maths.usyd.edu.au:8000/u/UG/IM/`

- Mathematics units are listed, by semester, in numerical order; then Statistics units are listed in numerical order.
- Units are designated *Normal* or *Advanced*. Entry to an Advanced level unit normally requires a Credit or better in a Normal level pre-requisite, or a Pass or better in an Advanced level pre-requisite.
- Summer School units are worth 4 credit points. All other units are worth 6 credit points.
- Mathematics units are also labelled *Applied*, or *Pure*, or both.
- The Unitcode for an Intermediate Unit in the School consists of MATH or STAT followed by 4 digits–for example MATH2063 or STAT2011. The first digit indicates that it is an Intermediate unit. The second digit indicates normal (0 or 1), or advanced (9). Any two units which share the same last two digits are mutually exclusive. (For example, MATH2061 may not be counted with MATH2961.)
- Text and reference books are yet to be advised. Except for *the little blue book* it is suggested that you do not purchase any books until recommendations are made by lecturers.

  The little blue book is a compact reference book: it contains definitions, formulas and important results from Junior Mathematics which are used in Intermediate Units. It is recommended that all students have access to this book: it is available from the Co-op Bookshop.

2.1. Mathematics Units: Summer School

MATH2001 Vector Calculus and Complex Variables 4 credit points

Summer School, Pure and Applied, Normal
Prerequisite: (*MATH1001* or *MATH1901* or *MATH1906*) and (*MATH1002* or *MATH1902*) and (*MATH1003* or *MATH1903* or *MATH1907*)
Prohibition: May not be counted with *MATH2901*.
Classes: 3 lectures and 1 tutorials per week.
Assessment: One 2 hour examination paper, quizzes and assignments

The first section of this unit is a study of functions of several variables from a vector point of view. It builds on the work covered in the calculus and vector components of junior mathematics. Vector calculus is indispensable as a mathematical tool for the study of various physical phenomena in many areas of science and engineering.

Topics include: Line integrals, multiple integrals, surface integrals, conservative fields, divergence, curl, flux, and the theorems of Green, Gauss and Stokes.

The second part of the unit is an introduction to the theory of functions of complex variables, often considered as one of the most elegant theories of mathematics. The emphasis is on integration, and topics include:
The Cauchy-Riemann conditions, contour integration, Cauchy's Integral Theorem and Cauchy's Integral Formula, residue theory and its application to evaluating certain real integrals.

Textbook

SC Britton and K-G Choo. *Lecture Notes for Calculus and Complex Variables*. School of Mathematics and Statistics, University of Sydney, 2004.

Reference Books

SC Britton CE Coleman and J Henderson. *the little blue book*. School of Mathematics and Statistics, University of Sydney, 1999. ISBN 1 86487 028 1.

Erwin Kreyszig. *Advanced engineering mathematics*. John Wiley, New York, eighth edition, 1999. ISBN 047133328X.

James Stewart. *Calculus*. Brooks/Cole Publishing Company, Pacific Grove, CA93950, USA, fourth edition, 1999. ISBN 0534359493.

MATH2002 Matrix Applications 4 credit points

Summer School, Pure and Applied, Normal
Prerequisite: MATH1002 or MATH1902 or Distinction in MATH1012.
Prohibition: May not be counted with MATH2902.
Classes: 2 lectures, 1 tutorials and 1 computer labs per week.
Assessment: One 2 hour examination paper, quizzes and assignments

This unit is a continuation of the first year Linear Algebra module Math1002 and deals with vectors and matrices in a more general setting. Along with the theoretical study of vector spaces, the unit also contains examples of how the theory is applied to problems of interest in scientific and engineering disciplines. There are weekly computer-based lab sessions, which supplement the regular face-to-face tutorials. No previous knowledge of computers is required.

Topics for the lectures will be selected from:
Systems of linear equations: existence and uniqueness of solutions, efficiency of different methods of solution, LU factorisation, partial pivoting.
Vector spaces and subspaces: linear combinations, linear independence, spanning sets, basis, dimension, fitting polynomials to data sets, linear transformations.
Eigenvalues and eigenvectors: similarity, diagonalisation, applications to population distribution problems, difference equations, linked differential equations, iterative methods for calculating eigenvalues/eigenvectors and solutions of linear systems, quadratic forms.

This unit follows on from junior units in linear algebra.

Textbook

J Henderson. *Lecture Notes for Matrix Applications*. School of Mathematics and Statistics, University of Sydney, 2004.

Reference Books

Howard Anton. *Elementary linear algebra*. J Wiley, New York, eighth edition, 2000. ISBN 0471170550.

Howard Anton and Chris Rorres. *Elementary linear algebra: applications version*. Wiley, New York, eighth edition, 2000. ISBN 0471170526.

SC Britton CE Coleman and J Henderson. *the little blue book*. School of Mathematics and Statistics, University of Sydney, 1999. ISBN 1 86487 028 1.

David C Lay. *Linear algebra and its applications*. Addison-Wesley, Reading, Mass, second edition, 2000. ISBN 0201649454.

Steven J Leon. *Linear algebra with applications*. Prentice Hall, Upper Saddle River, N.J., sixth edition, 2002. ISBN 0130337811.

Ben Noble and James W Daniel. *Applied linear algebra*. Prentice-Hall, Englewood Cliffs, NJ, third edition, 1988. ISBN 0130412600.

Gilbert Strang. *Linear algebra and its applications*. Harcourt, Brace, Jovanovich, San Diego, third edition, 1988. ISBN 0155510053.

MATH2005 Fourier Series and Differential Equations 4 credit points

Summer School, Applied and Pure, Normal
Prerequisite: (*MATH1001* or *MATH1901* or *MATH1906*) and (*MATH1002* or *MATH1902*) and (*MATH1003* or *MATH1903* or *MATH1907*)
Prohibition: May not be counted with *MATH2905*.
Classes: 3 lectures and 1 tutorials per week.
Assessment: One 2 hour examination paper, quizzes and assignments

Fourier Series (4 weeks) . In this part of the unit, periodic phenomena such as wave motion are given a systematic treatment. The basic problem is to represent a periodic function of one variable as the sum of an infinite series of sines and cosines. The theory has extensive applications in engineering and all scientific disciplines.

Ordinary and Partial Differential Equations (9 weeks) . This part of the unit consists of two sections, both oriented explicitly to the solution of those ordinary and partial differential equations frequently encountered in Mathematical Physics and Engineering.

The first section of approximately 15 lectures studies the method of solution of basic first and second order ordinary differential equations. A review of first order equations is followed by a systematic treatment of second order equations using the methods of variation of parameters, undetermined coefficients and the theory of Laplace Transforms. Linear systems of differential equations are treated using matrices and vectors. The phase plane is introduced, and the classification of critical points and stability are discussed.

The second section of approximately 12 lectures is an introduction to partial differential equations. The emphasis is on the application of the method of separation of variables to first and second order linear equations. Several lectures are used to study the solution of initial value problems using Laplace transforms.

This unit follows on from junior calculus units, and is useful preparation for all normal level senior units which involve calculus.

Reference Books

Erwin Kreyszig. *Advanced engineering mathematics*. John Wiley, New York, eighth edition, 1999. ISBN 047133328X.

MATH2009 Graph Theory 4 credit points

Summer School, Pure, Normal
Prerequisite: 6 credit points of Junior Mathematics (at Distinction level in Life Sciences units)
Classes: 3 lectures and 1 tutorials per week.
Assessment: One 2 hour examination paper, quizzes and assignments

Graph Theory is a branch of discrete mathematics. Discrete mathematics deals with objects which are "discrete" or "separate", such as the natural numbers, or subsets of a set – in contrast to areas of mathematics which deal with continuous things, such as the real numbers. In graph theory the objects are graphs, which are sets of point and edges (not graphs of functions). Graph theory has widespread applications in almost every branch of science, and particularly in computer science and engineering.

Topics covered include: Eulerian and Hamiltonian graphs; the theory of trees (used in the study of data structures); planar graphs; the study of chromatic polynomials (important in scheduling problems); maximal flows in networks; matching theory; activity networks; digraphs.

Most importantly, Graph Theory is enormous fun, and in this unit you will see how it can be used to solve the "Instant Insanity" puzzle, the Königsberg Bridge problem, and other famous problems of recreational mathematics.

This unit is similar in flavour to Discrete Mathematics MATH1004 and MATH1904, but does not assume that students have taken one of these units.

Reference Books

SC Britton CE Coleman and J Henderson. *the little blue book*. School of Mathematics and Statistics, University of Sydney, 1999. ISBN 1 86487 028 1.

Edgar G Goodaire and Michael M Parmenter. *Discrete mathematics with graph theory*. Prentice Hall, Upper Saddle River NJ, 1998. ISBN 0136020798.

Robin J Wilson. *Introduction to graph theory*. Pearson Education, Harlow, fourth edition, 1996. ISBN 0582249937.

MATH2011 Topics in Discrete Mathematics 4 credit points

Summer School, Pure, Normal
Prerequisite: 6 credit points from Junior Mathematics Units.
Prohibition: May not be counted with *MATH1004* or *MATH1904*.
Classes: 2 lectures, 1 tutorials and 1 practicals per week.
Assessment: One 2 hour examination paper, quizzes and assignments

In this unit we introduce students to several related areas of discrete mathematics, which serve their interests for further study in pure and applied mathematics, computer science and engineering. Topics include recursion; summation techniques; recurrences and generating functions; elementary number theory, including an introduction to primality testing and cryptography; combinatorics, including connections with probability theory; asymptotics and analysis of algorithms; set theory and logic.

Textbook

David Easdown. *A Course in Discrete Mathematics*. School of Mathematics and Statistics, University of Sydney, 2004.

Reference Books

Alfred V Aho and Jeffrey D Ullman. *Foundations of computer science*. Computer Science Press, New York, 1992. ISBN 0716782332.

K G Choo and D E Taylor. *Introduction to Discrete Mathematics*. Longman Cheshire, Melbourne, Vic, Australia, 1995. ISBN 0582800552.

Ronald L Graham Donald E Knuth and Oren Patashnik. *Concrete mathematics: a foundation for computer science*. Addison-Wesley, Reading, Mass, 1989. ISBN 0201142368.

2.2. Mathematics Units: Semester 1

MATH2061 Linear Mathematics and Vector Calculus 6 credit points

Semester 1, Pure and Applied, Normal
Prerequisite: (*MATH1001* or *MATH1901* or *MATH1906*) and (*MATH1002* or *MATH1902*) and (*MATH1003* or *MATH1903* or *MATH1907*)
Prohibition: May not be counted with *MATH2001* or *MATH2901* or *MATH2002* or *MATH2902* or *MATH2961*.
Classes: 3 lectures, 1 tutorial and 1 practice class per week.
Assessment: One 3 hr exam, assignments, quizzes.

This unit starts with an investigation of linearity: linear functions, general principles relating to the solution sets of homogeneous and inhomogeneous linear equations (including differential equations), linear independence and the dimension of a linear space. The study of eigenvalues and eigenvectors, begun in junior level linear algebra, is extended and developed. Linear operators on two dimensional real space are investigated, paying particular attention to the geometrical significance of eigenvalues and eigenvectors. The unit then moves on to topics from vector calculus, including vector-valued functions (parametrised curves and surfaces; vector fields; div, grad and curl; gradient fields and potential functions), line integrals (arc length; work; path- independent integrals and conservative fields; flux across a curve), iterated integrals (double and triple integrals; polar, cylindrical and spherical coordinates; areas, volumes and mass; Green's Theorem), flux integrals (flow through a surface; flux integrals through a surface defined by a function of two variables, though cylinders, spheres and parametrised surfaces), Gauss' Divergence Theorem and Stokes' Theorem.

MATH2063 Mathematical Computing and Nonlinear Systems 6 credit points

Semester 1, Applied, Normal
Prerequisite: (*MATH1001* or *MATH1901* or *MATH1906*) and (*MATH1002* or *MATH1902*) and (*MATH1003* or *MATH1903* or *MATH1907*)
Prohibition: May not be counted with *MATH2003* or *MATH2903* or *MATH2006* or *MATH2906* or *MATH2963*.
Classes: 3 lectures, 1 tutorial and 1 computer lab per week.
Assessment: One 3 hr exam, assignments, quizzes.

This unit will introduce students to techniques of mathematical computation as applied to nonlinear systems, using the numerical programming language MATLAB and, where appropriate, computer algebra. This knowledge will be applied to a number of modelling problems, particularly those involving nonlinear mappings and nonlinear ordinary differential equations (ODEs). Throughout the unit of study the essential nonlinear theory will be developed, and the resulting ideas will be explored computationally. This will allow us to explore the modern concepts of chaos using a variety of examples, including the logistic map, the Henon map and the Lorenz equations. No prior knowledge of programming or of the MATLAB language or computer algebra is required.

MATH2067 Differential Equations and Vector Calculus for Engineers 6 credit points
Semester 1, Engineering Faculty only, Normal
Prerequisite: (*MATH1001* or *MATH1901* or *MATH1906*) and (*MATH1002* or *MATH1902*) and (*MATH1003* or *MATH1903* or *MATH1907*)
Prohibition: May not be counted with *MATH2001* or *MATH2901* or *MATH2005* or *MATH2905* or *MATH2061* or *MATH2961*.
Classes: 3 lectures, 1 tutorial and 1 practice class per week.
Assessment: One 3 hr exam, mid-semester test, assignments.

The unit starts by introducing students to solution techniques of ordinary and partial differential equations (ODEs and PDEs) relevant to the engineering disciplines: it provides a basic grounding in these techniques to enable students to build on the concepts in their subsequent engineering classes. The main topics are Fourier series, second order ODEs, including inhomogeneous equations and Laplace transforms, and second order PDEs in rectangular domains (solution by separation of variables).

The unit moves on to topics from vector calculus, including vector-valued functions (parametrised curves and surfaces; vector fields; div, grad and curl; gradient fields and potential functions), line integrals (arc length; work; path-independent integrals and conservative fields; flux across a curve), iterated integrals (double and triple integrals; polar, cylindrical and spherical coordinates; areas, volumes and mass; Green's Theorem), flux integrals (flow through a surface; flux integrals through a surface defined by a function of two variables, though cylinders, spheres and parametrised surfaces), Gauss's Divergence Theorem and Stokes' Theorem.

MATH2069 Discrete Maths and Graph Theory 6 credit points
Semester 1, Pure, Normal
Prerequisite: 6 credit points of Junior Mathematics.
Prohibition: May not be counted with *MATH2011* or *MATH2009* or *MATH2969*.
Classes: 3 lectures, 1 tutorial and 1 practice class per week.
Assessment: Two 1.5 hr exams, assignments, quizzes.

We introduce students to several related areas of discrete mathematics, which serve their interests for further study in pure and applied mathematics, computer science and engineering. Topics to be covered in the first part of the unit include recursion and induction, generating functions and recurrences, combinatorics, including connections with probability theory, asymptotics and analysis of algorithms, set theory and logic. Topics covered in the second part of the unit include Eulerian and Hamiltonian graphs, the theory of trees (used in the study of data structures), planar graphs, the study of chromatic polynomials (important in scheduling problems), maximal flows in networks, matching theory.

MATH2961 Linear Algebra and Vector Calculus (Advanced) 6 credit points

Semester 2, Pure and Applied, Advanced
Prerequisite: (*MATH1901* or *MATH1906* or Credit in *MATH1001*) and (*MATH1902* or Credit in *MATH1002*) and (*MATH1903* or *MATH1907* or Credit in *MATH1003*)
Prohibition: May not be counted with *MATH2001* or *MATH2901* or *MATH2002* or *MATH2902* or *MATH2061*.
Classes: 4 lectures and 1 tutorial per week.
Assessment: One 3 hr exam, assignments.

This unit is an advanced version of MATH2061, with more emphasis on the underlying concepts and on mathematical rigour. Topics from linear algebra focus on the theory of vector spaces and linear transformations. The connection between matrices and linear transformations is studied in detail. Determinants, introduced in first year, are revised and investigated further, as are eigenvalues and eigenvectors. The calculus component of the unit includes local maxima and minima, Lagrange multipliers, the inverse function theorem and Jacobians. There is an informal treatment of multiple integrals: double integrals, change of variables, triple integrals, line and surface integrals, Green's theorem and Stokes' theorem.

MATH2962 Real and Complex Analysis (Advanced) 6 credit points

Semester 1, Pure, Advanced
Prerequisite: (*MATH1901* or *MATH1906* or Credit in *MATH1001*) and (*MATH1902* or Credit in *MATH1002*) and (*MATH1903* or *MATH1907* or Credit in *MATH1003*)
Prohibition: May not be counted with *MATH2007* or *MATH2907*.
Classes: 3 lectures, 1 tutorial and 1 practice class per week.
Assessment: One 3 hr exam, assignments.

Analysis is one of the fundamental topics underlying much of mathematics including differential equations, dynamical systems, differential geometry, topology and Fourier analysis. Starting off with an axiomatic description of the real number system, this first course in analysis concentrates on the limiting behaviour of infinite sequences and series on the real line and the complex plane. These concepts are then applied to sequences and series of functions, looking at point-wise and uniform convergence. Particular attention is given to power series leading into the theory of analytic functions and complex analysis. Topics in complex analysis include elementary functions on the complex plane, the Cauchy integral theorem, Cauchy integral formula, residues and related topics with applications to real integrals.

MATH2963 Mathematical Computing and Nonlinear Systems (Adv.) 6 credit points

Semester 1, Applied, Advanced
Prerequisite: (*MATH1901* or *MATH1906* or Credit in *MATH1001*) and (*MATH1902* or Credit in *MATH1002*) and (*MATH1903* or *MATH1907* or Credit in *MATH1003*).
Prohibition: May not be counted with *MATH2003* or *MATH2903* or *MATH2006* or *MATH2906* or *MATH2063*.
Classes: 3 lectures, 1 tutorial and 1 computer lab per week.
Assessment: One 3 hr exam, 2 assignments, quizzes.

The content of this unit of study parallels that of MATH2063, but both computational and theory components will place more emphasis on advanced topics, including Lyapunov exponents, stability, 2- and 3-cycles for mappings and concepts such as strange attractors. No prior knowledge of programming or of the MATLAB language or computer algebra is required.

See the description under MATH2063.

MATH2969 Discrete Maths and Graph Theory (Advanced) 6 credit points

Semester 1, Pure, Normal
Prerequisite: 9 credit points of advanced level Junior Mathematics (or normal level with Credit average).
Prohibition: May not be counted with *MATH2011* or *MATH2009* or *MATH2069*.
Classes: 3 lectures, 1 tutorial and 1 practice class per week.
Assessment: Two 1.5 hr exams, assignments, quizzes.

This unit will cover the same material as MATH2069 with some extensions and additional topics.

2.3. Mathematics Units: Semester 2

MATH2065 Introduction to Partial Differential Equations 6 credit points
Semester 2, Pure and Applied, Normal
Prerequisite: (*MATH1001* or *MATH1901* or *MATH1906*) and (*MATH1002* or *MATH1902*) and (*MATH1003* or *MATH1903* or *MATH1907*).
Prohibition: May not be counted with *MATH2005* or *MATH2905* or *MATH2965* or *MATH2067*.
Classes: 3 lectures, 1 tutorial and 1 practice class per week.
Assessment: One 3 hr exam, mid-semester test, assignments.

This is an introductory course in the analytical solutions of partial differential equations and boundary value problems. The techniques covered include separation of variables, Fourier series, Fourier transforms and Laplace transforms.

MATH2068 Number Theory and Cryptography 6 credit points
Semester 2, Pure, Normal
Prerequisite: 9 credit points of Junior Mathematics including *MATH1002* or *MATH1902*.
Prohibition: May not be counted with *MATH3024* or *MATH3009*.
Classes: 3 lectures, 1 tutorial and 1 computer lab per week.
Assessment: One 3 hr exam, assignments, quizzes.

Cryptography is the branch of mathematics that provides the techniques for confidential exchange and authentication of information sent over public networks. This unit introduces tools from elementary number theory, then applies them to the analysis of block ciphers and stream ciphers, as the foundation for modern public key cryptography.

MATH2070 Optimisation and Financial Mathematics 6 credit points

Semester 2, Applied, Normal
Prerequisite: (*MATH1001* or *MATH1901* or *MATH1906*) and (*MATH1002* or *MATH1902*).
Assumed Knowledge: *MATH1003* or *MATH1903* or *MATH1907*.
Prohibition: May not be counted with *MATH2010* or *MATH2033* or *MATH2933* or *ECMT3510 Operations Research A*.
Classes: 3 lectures, 1 tutorial and 1 computer lab per week.
Assessment: One 3 hr exam, assignments, quizzes.

Problems in industry and commerce often involve maximising profits or minimising costs subject to constraints arising from resource limitations. The first part of this unit looks at the important class of linear optimisation programming problems and their solution using the simplex algorithm.

The second part of the unit is an introduction to financial concepts and terminology, and some of the methods for pricing securities and evaluating investments in the absence of risk. This includes material on the riskless term structure of interest rates; the modelling of investments modelled by difference and differential equations; arbitrage and the Efficient Market Hypothesis; the net present value and internal rate of return; bonds; simple optimisation problems in finance.

The third part of the unit deals with risky securities and investments and includes material on: modelling risky assets by random variables; pricing by the expectations hypothesis; pricing under the principle of expected utility; state space security pricing; complete and incomplete markets. Some understanding of probability theory and statistical distributions is required in this section.

Theory developed in lectures will be complemented by computer laboratory sessions using MATLAB. Minimal computing experience will be required.

MATH2965 Introduction to Partial Differential Equations (Advanced) 6 credit points

Semester 2, Applied, Advanced
Prerequisite: (*MATH2961* or Credit in *MATH2061*) or (*MATH2901* or Credit in *MATH2001*) and (*MATH2902* or Credit in *MATH2002*)).
Prohibition: May not be counted with *MATH2005* or *MATH2905* or *MATH2065*.
Classes: 3 lectures, 1 tutorial and 1 computer lab per week.
Assessment: One 3 hr exam, assignments.

This unit of study is essentially an advanced version of MATH2065, the emphasis being on solutions of differential equations in applied mathematics. The theory of ordinary differential equations is developed for second order linear equations, including series solutions, special functions and Laplace transforms. Some use is made of computer programs such as Mathematica. Methods for PDEs (partial differential equations) and boundary-value problems include separation of variables, Fourier series and Fourier transforms.

MATH2968 Algebra (Advanced) 6 credit points

Semester 2, Pure, Advanced
Prerequisite: 9 credit points of Junior Mathematics (advanced level or Credit at normal level) including (*MATH1902* or Credit in *MATH1002*).
Prohibition: May not be counted with *MATH2908* or *MATH2918* or *MATH2008*.
Classes: 3 lectures, 1 tutorial and 1 practice class per week.
Assessment: One 3 hr exam, assignments.

This unit provides an introduction to modern abstract algebra, via linear algebra and group theory. It starts with a revision of linear algebra concepts from junior mathematics and MATH2961, and proceeds with a detailed investigation of inner product spaces over the real and complex fields. Applications here include least squares lines and curves of best fit, and approximation of continuous functions by finite Fourier series. Further topics in linear algebra covered in this unit include dual space, quotient spaces and (if time permits) possibly tensor products. The second part of the unit is concerned with introductory group theory, motivated by examples of matrix groups and permutation groups. Topics include actions of groups on sets, including linear actions on vector spaces. Subgroups, homomorphisms and quotient groups are investigated, and the First Isomorphism Theorem is proved.

MATH2970 Optimisation and Financial Mathematics (Advanced) 6 credit points

Semester 2, Applied, Advanced
Prerequisite: (*MATH1901* or *MATH1906* or Credit in *MATH1001*) and (*MATH1902* or Credit in *MATH1002*).
Assumed Knowledge: *MATH1903* or *MATH1907* or Credit in *MATH1003*.
Prohibition: May not be counted with *MATH2010* or *MATH2033* or *MATH2933* or *MATH2070*.
Classes: 3 lectures, 1 tutorial and 1 computer lab per week.
Assessment: One 3 hr exam, assignments, quizzes.

The content of this unit of study parallels that of MATH2070, but with more emphasis on Advanced topics, including the Fundamental Duality Theorem, game theory, state security prices, risk neutral pricing and binomial option pricing.

2.4. Mathematical Statistics Units

STAT2011 Statistical Models introduces both data analysis and ideas of probability and statistical distributions used to explain variability of data. STAT2012 Statistical Tests deals with the methods of statistical analysis of data. Both courses are required to proceed to most Senior Statistics courses. For students who wish an introduction to statistical theory, including some probability, STAT2011 could stand alone and could lead to study of stochastic processes in the Senior year, and so may be suited to students of Financial Mathematics and Physics. For students whose interest is only in applications of statistics, it would be possible to follow a Junior Statistics course with STAT2012 and to proceed to 12 credit points of Senior courses on applied statistics.

The advanced course, STAT2911 Probability and Statistical Models, gives a more serious introduction to probability and mathematical statistics, while covering the development of statistical models in STAT2011. Similarly, STAT2912 Statistical Tests (Advanced) gives a more mathematically based treatment of classical statistical methods while covering the ideas introduced in STAT2012.

STAT2011 Statistical Models 6 credit points

Semester 1, Normal
Prerequisite: (*MATH1001* or *MATH1901* or *MATH1906* or *MATH1011*) and [(*MATH1005* or *MATH1905* or *MATH1015* or *STAT1021*)].
Prohibition: May not be counted with *STAT2901* or *STAT2001* or *STAT2911*.
Classes: 3 lectures, 1 tutorial and 1 computer lab per week.
Assessment: One 3 hr exam, assignments/quizzes, computer practical reports, one 1 hr computer practical class assessment task.

This unit provides an introduction to univariate techniques in data analysis and the most common statistical distributions that are used to model patterns of variability. Common discrete random variable models, like the binomial, Poisson and geometric, and continuous models, including the normal and exponential, will be studied. The method of moments and maximum likelihood techniques for fitting statistical distributions to data will be explored. The unit will have weekly computer classes where candidates will learn to use a statistical computing package to perform simulations and carry out computer intensive estimation techniques like the bootstrap method.

STAT2012 Statistical Tests 6 credit points

Semester 2, Normal
Prerequisite: *MATH1005* or *MATH1905* or *MATH1015*
Assumed Knowledge: *STAT2011* or *STAT2001*
Prohibition: May not be counted with *STAT2004* or *STAT2912* or *STAT1022*.
Classes: 3 lectures, 1 tutorial and 1 computer lab per week.
Assessment: One 3 hr exam, assignments/quizzes, computer practical reports, one 1 hr computer practical class assessment task.

The unit provides an introduction to the standard methods of statistical analysis of data: Tests of hypotheses and confidence intervals, including t-tests, analysis of variance, regression - least squares and robust methods, power of tests, non-parametric tests, non-parametric smoothing, tests for count data - goodness of fit, contingency tables. Graphical methods and diagnostics are used throughout with all analyses discussed in the context of computation with real data using an interactive statistical package.

STAT2911 Probability and Statistical Models (Advanced) 6 credit points

Semester 1, Advanced
Prerequisite: (*MATH1903* or *MATH1907* or Credit in *MATH1003*) and (*MATH1905* or Credit in *MATH1005*).
Prohibition: May not be counted with *STAT2001* or *STAT2011* or *STAT2901*.
Classes: 3 lectures, 1 tutorial and 1 computer lab per week.
Assessment: One 3 hr exam, assignments/quizzes, computer practical reports, one 1 hr computer practical class assessment task.

This unit is essentially an advanced version of STAT2011 with an emphasis on the mathematical techniques used to manipulate random variables and probability models. Common random variables including the Poisson, normal, beta and gamma families are introduced. Probability generating functions and convolution methods are used to understand the behaviour of sums of random variables. The method of moments and maximum likelihood techniques for fitting statistical distributions to data will be explored. The unit will have weekly computer classes where students will learn to use a statistical computing package to perform simulations and carry out computer intensive estimation techniques like the bootstrap method.

STAT2912 Statistical Tests (Advanced) 6 credit points

Semester 2, Advanced
Prerequisite: *MATH1905* or credit in *MATH1005* or credit in *MATH1015*.
Assumed Knowledge: *STAT2911* or *STAT2901*
Prohibition: May not be counted with *STAT2004* or *STAT2012* or *STAT1022*.
Classes: 3 lectures, 1 tutorial and 1 computer lab per week.
Assessment: One 3 hr exam, 2 assignments, quizzes, computer practical reports, one 1 hr computer practical class assessment task.

This unit is essentially an advanced version of STAT2012 with an emphasis on both methods and the mathematical derivation of these methods: Tests of hypotheses and confidence intervals, including t-tests, analysis of variance, regression - least squares and robust methods, power of tests, non-parametric methods, non-parametric smoothing, analysis of count data - goodness of fit, contingency tables. Graphical methods and diagnostics are used throughout with all analyses discussed in the context of computation with real data using an interactive statistical package.

3. Assessment

Individual lecturers will have different arrangements for the assessment in each course. During the first week of lectures you will be given an information sheet for each course, which will include details of the precise arrangement for assessment in each course. In some intermediate units the assessment includes tutorial participation marks, and quizzes, as well as assignments and the final exam. In general, the arrangements will NOT be the same as those to which you may have been accustomed in junior Mathematics units.

3.1. Semester Examinations

Each unit will be examined at the end of the semester in which it is offered. In most units, the exam does *not* count for 100% of the assessment.

3.2. Assignments

Mathematical skills and understanding cannot be acquired passively – for example, by attendance at lectures alone. On the contrary, it is essential that you attempt, on your own, as many relevant problems as possible. Assignments are set and marked in order to give you extra practice, and to provide you with feedback on how you are handling the material. There is very little point in copying someone else's assignment. The number of assignments collected in each unit will be announced by the lecturer during the first week of lectures.

To facilitate the collection and return of assignments, you are asked to adhere to the following guidelines (unless you are told otherwise by your lecturer):

Solutions to assignments should be written on lined paper using one side of the paper only, with plenty of space left for corrections by the markers. Untidy work may not be marked. Your solutions should be *stapled* to a manila folder, on the cover of which you should write in block letters your name, faculty and SID. (Paper clips are unsuitable as they catch on other folders and are pulled off.) To aid the return of assignments, please place the first letter of your family name in the centre of the front of your folder, writing it very large.

Some collaboration between students on assignments is encouraged, since it can be a real aid to understanding. Thus it is legitimate for students to discuss assignment questions at a general level, provided everybody involved makes some contribution. However, students should produce their own individual written solution. Students should not look at another student's written assignment, nor allow their own assignment to be looked at by someone else. Students submitting identical solutions will be heavily penalised regardless of who copied from whom.

Individual lecturers organise the distribution, marking and return of the assignments for their own unit, and will advise you as to the method of collection. Unless there are exceptional circumstances, any application for an

extension must be made to the lecturer before the submission date. Such applications must be accompanied by appropriate documentation supporting the request. In pure and applied units late submissions without an approved extension may be accepted, but will attract a penalty. Assignments will not, of course, be accepted after marked assignments have been returned or solutions have been made available. In statistics late submissions without an approved extension of time will not be accepted.

3.3. Quizzes, participation marks

If you are taking a course in which the assessment includes marks for quizzes, or for tutorial participation, you will be given relevant information in the first week of lectures. Make sure you know exactly what the assessment requirements are for each of the courses in which you are enrolled.

3.4. Illness or misadventure

The following is an extract from the University's "Academic Policies and Procedures".

Students who, through serious illness or misadventure, are unable to complete an assessment may be offered special consideration. Students have a right to ask for such consideration which will be determined by a department and/or by the Board of Examiners. Students have an obligation to know their faculty's requirements. Difficulties must be fully documented so that an appropriate evaluation of the circumstances and severity of their experiences can be made. Students are required to provide the information to faculties and/or departments as soon as possible.

It should be noted that **only well-attested serious illness or misadventure during a semester or occurring at the time of an examination will warrant special consideration. Occasional brief or trivial illness would not normally be regarded as sufficient to explain an absence or a poor performance and students are discouraged from submitting certificates for absences totalling less than one or two weeks,** although frequently recurrent short absences would need documentation. While it is important to ask for a medical certificate for illness of longer than a few days duration at the time of the first visit, there is no need to submit it unless the illness becomes prolonged or further frequent absences are required. The exact nature of misadventure will vary, but serious illness or death of a close family member, particularly at the time of the examinations, would clearly warrant consideration.

Students who, because of serious illness or adverse circumstances, are prevented from attending classes for prolonged periods should seek an interview with a member of the department(s) concerned and/or the relevant Sub-Dean. Even if they do not exceed any specified permitted period of absence, they

may need to consider whether their best academic interests are served by discontinuing with permission from the course until they are able to resume their studies effectively.

3.5. Special Consideration

The School's policy on granting Special Consideration is available on the Web at `http://www.maths.usyd.edu.au:8000/u/sandrab/scpolicy.html`

3.6. Further Assessment

Further assessment is a privilege, not a right. Students who have been prevented by duly certified illness or misadventure from completing an examination or assessment task **may** be given the opportunity to be further assessed.

If you miss an exam, you should NOT assume that you will automatically be granted further assessment.
Further assessment will not necessarily take the form of a written supplementary examination. It may involve an oral exam, or some other form of assessment.

All enquiries should be made to the appropriate co-ordinator.

3.7. Results

At the end of each semester, examination results are posted on the web, as well as being mailed to students. Any marks which are released prior to this are provisional only.

3.8. Academic Honesty

Academic Board guidelines on academic honesty may be found at

`http://policy.rms.usyd.edu.au/000007x.pdf`

4. Additional Information

4.1. Enrolment, Registration and Timetable

Students do not need to register separately with the School of Mathematics and Statistics. This will be done automatically at re-enrolment.

Before Semester 1 begins, you will be given an individual timetable with lecture times, tutorial times and locations for any intermediate mathematics or statistics unit in which you are enrolled.

4.2. Change of Enrolment

Any change of enrolment must be made before the HECS cut-off date in each semester. (These dates are usually within a month or so of the beginning of semester.) After the cut-off dates it is not possible to enrol in additional units, nor to withdraw from a unit without incurring HECS fees. Note that some faculties may have earlier dates after which it is not possible to enrol in additional units.

It is your responsibility to make any desired changes to your enrolment before the relevant dates. All changes must be made at your faculty office.

4.3. Lectures

You are expected to attend lectures. If you do not attend lectures, you should be aware that important announcements relating to all aspects of the unit of study are often made in lectures. It is **your responsibility** to find out the content of any such announcements in the event that you were absent when they were made.

4.4. Tutorials and Lab Sessions

The number of tutorials and lab sessions you attend depends on the units you are taking. Details for each unit are given in Chapter 2.

Tutorial exercise sheets are usually given out during the lectures of the preceding week. For most units, they will also be posted on the unit website. Extra tutorial and assignment sheets for mathematics courses are placed in the wooden boxes in the corridors on Carslaw Level 7 and Carslaw Level 6, and for statistics in the boxes outside room 829. Co-ordinators do **not** have spare tutorial and assignment sheets.

You will gain maximum benefit from a tutorial if you have attempted the tutorial exercises before the actual tutorial, since you will then be able to ask the tutor for help with any exercises that cause you difficulties.

Tutorial classes will usually begin in the second week of each semester.

4.5. Noticeboards and Pigeonholes

Noticeboards for Intermediate Mathematics are located on Level 3 of Carslaw (near the pyramids) and on Level 6 of Carslaw outside room 624.

The noticeboard for Statistics is located on Level 8 of Carslaw, outside room 817.

Important notices will be displayed on these noticeboards. Other notices may be displayed on or outside co-ordinators' doors, and also on the Intermediate Mathematics website.

The assignment hand-in boxes, and pigeonholes for return of mathematics assignments are located on Level 3 of Carslaw (near the noticeboards), and on Level 6 of Carslaw outside room 623. Statistics assignments are handed in, and returned, in Carslaw room 829.

4.6. Consultations

Students should take general questions about course organisation to the appropriate co-ordinator. Questions about content of a course should be discussed with the lecturer or tutors for that course, during tutorials or scheduled consultation hours. Consultation hours will be announced in lectures and on noticeboards early in the semester.

4.7. Solutions to Tutorials and Assignments

At the discretion of the lecturer, solutions to assignments and tutorials may be posted on the website and/or made available from either

KOPYSTOP, 22-36 Mountain Street, Broadway

or

University Copy Centre, Ground Floor

Noel Martin Recreation Centre.

4.8. Scholarships and Prizes

Science students should be aware that the ranking for post-graduate scholarships in the Science Faculty is determined by combining the Science weighted average mark (SCIWAM) and the Honours mark in the ratio 35:65. The SCIWAM is calculated from all Intermediate and Senior units undertaken with a weighting of 2 for Intermediate units and 3 for Senior units.

A number of prizes are awarded to outstanding achievers. These are listed in the University Calendar.

Sydney University Mathematical Society

ΣUMS (pronounced 'sums') is an informal group run by students that aims to promote interest in mathematics. Every mathematics student is automatically a member. ΣUMS organises talks by mathematicians, an annual problem solving competition and various events such as the ΣUMS musical. Events are advertised on the ΣUMS noticeboard on Level 1 of Carslaw (near the lifts) and everybody is very welcome to attend and be involved. Contributions to the ΣUMS newsletter, ΣUMS+ Plus, are also welcome, and can be placed in the ΣUMS box in the Mathematics Library.

5. Lecture Timetable

The timetable is provisional and MAY CHANGE. The times shown are lectures and practice sessions only, not tutorials or computer labs. No distinction has been made between lectures and practice sessions.

Unit	Ser	Mon	Tue	Wed	Thu	Fri
Semester 1						
MATH2061	1 2	8.00 9.00	8.00 9.00	8.00 9.00	8.00 9.00	
MATH2063		10.00	10.00	10.00		
MATH2067		8.00	8.00	8.00	8.00	
MATH2069		2.00	2.00	2.00	2.00	
MATH2961		8.00	8.00	8.00	8.00	
MATH2962		9.00	9.00	9.00	9.00	
MATH2963		10.00	10.00	10.00		
MATH2969		2.00	2.00	2.00	2.00	
STAT2011		11.00	11.00	11.00		
STAT2911		11.00	11.00	11.00		
Semester 2						
MATH2065	1 2	8.00 9.00	8.00 9.00	8.00 9.00	8.00 9.00	
MATH2068		2.00	2.00	2.00		
MATH2070		10.00	10.00	10.00		
MATH2965		8.00	8.00	8.00	8.00	
MATH2968		9.00	9.00	9.00	9.00	
MATH2970		10.00	10.00	10.00		
STAT2012		11.00	11.00	11.00		
STAT2912		11.00	11.00	11.00		

6. Contacts

If you wish to discuss the information in this handbook, or need general advice about mathematics or statistics in second year, you should consult the appropriate co-ordinator.

The co-ordinators are also the people you should consult whenever you have enquiries, or problems of an administrative nature, relating to intermediate mathematics or statistics courses.

Pure Mathematics	Dr Bill Palmer, Carslaw room 525 Phone: 9351 3048 email: pm2coord@maths.usyd.edu.au
Applied Mathematics	Dr David Ivers, Carslaw room 623 Phone: 9351 3561 email: am2coord@maths.usyd.edu.au
Statistics	Dr Shelton Peiris, Carslaw room 819 Phone: 9351 5764 email: st2coord@maths.usyd.edu.au

For information about the content of a particular unit approach a unit lecturer: each unit has an email address of the form

`UnitCode@maths.usyd.edu.au`

(e.g. `MATH2001@maths.usyd.edu.au`).