Contents

Chapter 1. General Information and Advice

§1. Why Choose Mathematics?

Mathematics in general plays a crucial role in our attempts to understand the world around us. We see this demonstrated in the extensive use of mathematical models in the theoretical and applied sciences: from physics and chemistry through to engineering, operations research, computer science, information theory and economics. Many important models are based on modern mathematical research. Examples from *applied mathematics* research are the application of stochastic ODE's in finance and physics, our increased understanding of chaotic behaviour and its application to a wide range of physical phenomena and the development of improved large-scale numerical techniques used on an everyday basis for applications ranging from weather prediction to models of artificial hearts. Examples from *pure mathematics* research are the application of number theory to cryptography, applications of singularity theory and group theory to symmetry-breaking and bifurcation in the engineering sciences, the application of category theory to theoretical computer science and the recent developments of general field theories in mathematical physics based on the most profound work in complex analysis and algebraic geometry.

As quantitative reasoning and mathematical modelling techniques extend further into the medical and social sciences, the humanities and all areas of finance, there is an increasing demand for mathematically competent workers in these fields and for teachers of specific mathematical skills in both general and adult education. Employers increasingly value the logical thinking and problem solving skills that are developed by studying mathematics.

Pure Mathematics and Applied Mathematics

There are two separate disciplines within the general subject area — Pure Mathematics and Applied Mathematics. **You may choose units from either or both disciplines**.

- If you enjoy problem solving, working with computers and using your mathematics to deal with real applications in science, engineering, economics and biology then you should consider enrolling in some **Applied Mathematics** units. You will attain a high level of mathematical expertise and a good deal of practical computer experience, both of which will stand you in good stead in a wide variety of possible careers, for example in computing, finance, telecommunications and mathematics research.
- If you appreciate the elegance of conceptual reasoning, or enjoy the challenge of abstract problems, you should consider enrolling in some **Pure Mathematics** units. They are wise choices not only for those whose principal interest lies in mathematics itself, but for all who wish to extend their reasoning ability: many students whose main interests lie in other disciplines find Pure Mathematics an ideal second major. A wide variety of pure units are offered, at both Advanced and Normal levels, covering all major branches of mathematics.

§2. Why Choose Statistics?

Statistical techniques are employed in almost every aspect of daily life. These techniques are basically designed for data analysis and enable, for example, governments to plan our future through use of census data, businesses to forecast consumer demand for products, medical researchers to determine effectiveness of drugs, engineers to establish quality control standards, economists to use various indices of economic growth to attempt predictions of the future state of the economy, agricultural scientists to assess and compare the qualities of various soil types or strains of wheat or types of fertilizers and so on. The three facets of statistics are data analysis, probability modelling and statistical inference. Senior Statistics units provide the opportunity for further study in each of these areas.

As a result of the demand for statistical analysis across a broad spectrum of human endeavour and the ever increasing use of computers in data analysis, there is a growing demand for people trained in statistics both in the private and public sectors. This trend is likely to continue. Modelling and forecasting skills which are taught in the Senior Statistics courses are important in the areas of marketing, banking, finance and scientific research. Also, statistics will be useful for those contemplating a career in teaching. A major in statistics is always received positively by prospective employers as a relevant, useful area of training for potential employees.

§3. How Many Units of Study Should You Choose?

To satisfy the B.Sc degree regulations, each Science student must take at least 24 credit points of Senior (third year) units in a single Science subject Area, such as Mathematics or Statistics. This subject area is then termed a **major** for that student. Note that the subject area of Mathematics encompasses both Pure and Applied Mathematics, and is separate from the subject area of Statistics.

Very many students take two majors in their third year; for example, majors in Mathematics and Statistics, Mathematics and Computer Science, Statistics and Psychology, Mathematics and Physics, Mathematics and Chemistry, or a double major in Mathematics (48 credit points of Senior Mathematics units).

Each Senior unit of study offered by the School of Mathematics and Statistics is worth 6 credit points. **To major in Statistics** you must therefore complete four Senior Statistics units. **To major in Mathematics** you must complete four or more Senior Mathematics units. (A double major consists of eight Senior Mathematics units.) You may choose Pure Mathematics, Applied Mathematics or a mix of the two. If you are not majoring in Mathematics or Statistics, you can still choose any number of Senior level units of study from either area to complement your other subjects. In particular, students specialising in Engineering, Physics or Chemistry would find either of the following Statistics units of study useful: Stochastic Processes and Time Series (STAT3011/STAT3911), Applied Linear Models (STAT3012/STAT3912). For appropriate Pure/Applied Mathematics units, see Section 7 below.

§4. Financial Mathematics and Statistics

The major in Financial Mathematics and Statistics combines selected units from the subject areas of Statistics and Mathematics. This program is designed for students in double degrees who are interested in pursuing a career in the financial sector, but because of degree restrictions can only take a single Science major. It is also available for any student in the B.Sc. with an interest in finance and forecasting, and caters for those who wish to include Senior units other than Mathematics and Statistics units in their degree or who wish to complete a second major outside the School of Mathematics and Statistics. (Note that students in the B.Sc. who wish to specialize in this area can include all the units in the Financial Mathematics and Statistics program while completing a major in Mathematics or Statistics, or a major in Mathematics and a major in Statistics.) Students planning to take the Financial Mathematics and Statistics major and who are considering Honours should consult Dr Neville Weber, Carslaw room 818 (email address: `neville@maths.usyd.edu.au`), or Dr Martin Wechselberger, Carslaw room 628 (email address: `M.Wechselberger@maths.usyd.edu.au`) before finalizing their electives. To obtain a major in Financial Mathematics and Statistics a candidate will have to successfully complete the Senior units of study listed below. All of the core units must be completed, and at least one of the electives.

Core Units:

- MATH 3075/3975 Financial Mathematics 2
- STAT 3011/3911 Stochastic Processes and Time Series
- STAT 3012/3912 Applied Linear Models

Elective Units:

- MATH 3067 Information and Coding Theory
- MATH 3076/3976 Mathematical Computing
- MATH 3078/3978 Partial Differential Equations and Waves
- STAT 3013/3913 Statistical Inference
- STAT 3014/3914 Applied Statistics
- INFO 3404/3504 Database Systems 2

§5. Units of study available in 2008

Applied Mathematics units

Semester 1:
MATH 3063 Differential Equations and Biomathematics (Normal)
MATH 3076 Mathematical Computing (Normal)
MATH 3963 Differential Equations and Biomathematics (Advanced)
MATH 3976 Mathematical Computing (Advanced)
MATH 3977 Lagrangian and Hamiltonian Dynamics (Advanced)

Semester 2:
MATH 3075 Financial Mathematics (Normal)
MATH 3078 Partial Differential Equations and Waves (Normal)
MATH 3964 Complex Analysis with Applications (Advanced)[**Not offered in 2009**]
MATH 3974 Fluid Dynamics (Advanced)
MATH 3975 Financial Mathematics (Advanced)
MATH 3978 Partial Differential Equations and Waves (Advanced)

Pure Mathematics units

Semester 1:
MATH 3062 Algebra and Number Theory (Normal)
MATH 3063 Differential Equations and Biomathematics (Normal)
MATH 3065 Logic and Foundations (Normal)
MATH 3961 Metric Spaces (Advanced)
MATH 3962 Rings, Fields and Galois Theory (Advanced)
MATH 3963 Differential Equations and Biomathematics (Advanced)

Semester 2:
MATH 3061 Geometry and Topology (Normal)
MATH 3067 Information and Coding Theory (Normal)
MATH 3068 Analysis (Normal)
MATH 3964 Complex Analysis with Applications (Advanced)[**Not offered in 2009**]
MATH 3966 Modules and Group Representations (Advanced)
MATH 3968 Differential Geometry (Advanced)[**Not offered in 2008**]
MATH 3969 Measure Theory and Fourier Analysis (Advanced)

Mathematical Statistics units

Semester 1:
STAT 3011 Stochastic Processes and Time Series (Normal)
STAT 3012 Applied Linear Models (Normal)
STAT 3911 Stochastic Processes and Time Series (Advanced)
STAT 3912 Applied Linear Models (Advanced)

Semester 2:
STAT 3013 Statistical Inference (Normal)
STAT 3014 Applied Statistics (Normal)
STAT 3913 Statistical Inference (Advanced)
STAT 3914 Applied Statistics (Advanced)

§6. Senior Year Coordinators

The coordinators are the people you should consult if you need general information about the units of study, or advice on enrolment.
The coordinators for Pure Mathematics senior units are:

Dr Donald Cartwright	**Room 620, Carslaw Building, phone 9351 2973,** **email:** donaldc@maths.usyd.edu.au
A/Prof Bob Howlett	**Room 523, Carslaw Building, phone 9351 2976,** **email:** bobh@maths.usyd.edu.au

The coordinator for Applied Mathematics senior units is:

Dr David Ivers	**Room 623, Carslaw Building, phone 9351 3561,** **email:** david@maths.usyd.edu.au

The coordinator for Mathematical Statistics senior units is:

Dr Michael Stewart	**Room 820, Carslaw Building, phone 9351 5765,** **email:** M.Stewart@maths.usyd.edu.au

§7. Some Suggested Third Year Mathematics Programs

Choosing four of the units will constitute a major in Mathematics. The usual enrolment is two units per semester. You may, of course, choose fewer than four units or as many as eight units, to suit your own personal circumstances.
The wide choice of units available makes it possible to adapt third year mathematics programs to blend with and enhance the study of many other subjects. Some suggestions are given below. Note that units designated (N) are Normal level units, while those designated (A) are Advanced level.

(1) To complement **Computer Science**, students may wish to take some or all of the following units:

Semester 1. Algebra and Number Theory (MATH3062), Logic and Foundations (MATH3065), Rings, Fields and Galois Theory (MATH3962), Mathematical Computing (MATH3076/3976).

Semester 2. Information and Coding Theory (MATH3067), Modules and Group Representations (MATH3966), Geometry and Topology (MATH3061), Financial Mathematics (MATH3075/3975).

(2) To complement **Engineering**, students enrolled in the double degree B.Sc./B.E. would find any of the following of benefit to their professional careers:

Semester 1. Metric Spaces (MATH3961), Differential Equations and Biomathematics (MATH3063/3963), Logic and Foundations (MATH3065), Mathematical Computing (MATH3076/3976), Lagrangian and Hamiltonian Dynamics (MATH3977).

Semester 2. Measure Theory and Fourier Analysis (MATH3969), Partial Differential Equations and Waves (MATH3078/3978), Differential Geometry (MATH3968)[**Not offered in 2008**], Information and Coding Theory (MATH3067), Analysis (MATH 3068), Complex Analysis with Applications (MATH3964)[**Not offered in 2009**], Fluid Dynamics (MATH3974), Financial Mathematics (MATH3075/3975).

(3) To complement **Physics and Chemistry**, students may wish to consider:

Semester 1. Metric Spaces (MATH3961), Rings, Fields and Galois Theory (MATH 3962), Differential Equations and Biomathematics (MATH3063/3963), Logic and Foundations (MATH3065), Mathematical Computing (MATH3076/3976), Lagrangian and Hamiltonian Dynamics (MATH3977).

Semester 2. Measure Theory and Fourier Analysis (MATH3969), Modules and Group Representations (MATH3966), Partial Differential Equations and Waves (MATH3078/3978), Differential Geometry (MATH3968)[**Not offered in 2008**], Information and Coding Theory (MATH3067), Analysis (MATH3068), Fluid Dynamics (MATH3974), Financial Mathematics (MATH3075/3975), Complex Analysis with Applications (MATH3964)[**Not offered in 2009**], Geometry and Topology (MATH3061).

(4) Prospective **Teachers of Mathematics** might consider choosing from:

Semester 1. Algebra and Number Theory (MATH3062), Logic and Foundations (MATH3065), Differential Equations and Biomathematics (MATH3063/3963), Rings, Fields and Galois Theory (MATH3962), Metric Spaces (MATH3961), Mathematical Computing (MATH3076/3976).

Semester 2. Information and Coding Theory (MATH3067), Analysis (MATH3068), Geometry and Topology (MATH3061), Partial Differential Equations and Waves (MATH3078/3978).

(5) Intending **Pure Mathematics 4 and Applied Mathematics 4 students** must take at least 24 credit points of Senior level Mathematics. While students are free to choose from the whole range of units on offer across both Pure and Applied Mathematics, intending Applied Mathematics 4 students are advised to choose at least 3 units from the third year Applied Mathematics program, preferably including one or more at Advanced level. Intending Pure Mathematics 4 students are advised to choose at least 3 units from the third year Pure Mathematics program, and are strongly advised to include Metric Spaces (MATH3961) and Rings, Fields and Galois Theory (MATH3962).

§8. Entry Requirements for 4th Year Applied Mathematics

Students who are considering 4th year in Applied Mathematics are advised to consult members of staff in their areas of interest as well as the Third Year Coordinator for advice on choice of units. The staff members to consult are:

- **Nonlinear Mathematics** – Dr Mary Myerscough (Carslaw Building Rm 626)
- **Applied Mathematics** – Dr Dave Galloway (Carslaw Building Rm 712)

The entry qualification for Applied Mathematics 4 is normally a Credit average or better taken over **24 credit points of Senior Mathematics units**, and is subject to the approval of the Head of School. You must also have satisfied Faculty requirements. Students who do not meet these criteria but are particularly interested and motivated to do Honours should see the Applied Mathematics 4 Coordinator, Dr Martin Wechselberger, Carslaw room 628 (email address: `M.Wechselberger@maths.usyd.edu.au`) telephone 9351 3860. Further details are given in the Applied Mathematics 4 handbook.

§9. Entry Requirements for 4th Year Pure Mathematics

Students who are considering 4th year in Pure Mathematics are advised to consult members of staff in their areas of interest as well as the Third Year Coordinators for advice on choice of units. The staff members to consult are:

- **Algebra** – Dr David Easdown (Carslaw Building Rm 619)
- **Analysis** – Dr Donald Cartwright (Carslaw Building Rm 620)
- **Computational and Discrete Mathematics** – Prof John J Cannon (Carslaw Building Rm 618)
- **Geometry and Topology** – Dr Jonathan Hillman (Carslaw Building Rm 617)
- **Nonlinear Mathematics** – Prof E Norman Dancer (Carslaw Building Rm 717)

The entry qualification for Pure Mathematics 4 is either a Credit average or better taken over **24 credit points of Senior Mathematics units** (including a Credit on at least one Senior Pure Mathematics **Advanced unit**), or a Distinction average or better taken over **24 credit points of Senior Mathematics units**. Entry is also subject to the approval of the Head of School. In addition, all Faculty requirements must have been satisfied. Students who do not meet these criteria but are particularly interested and motivated to do Honours should see the Pure Mathematics 4 Coordinator, Dr Laurentiu Paunescu, Carslaw room 816, telephone 9351 2969. As mentioned above, it is highly recommended to take the Advanced level third year units Metric Spaces (A) and Rings, Fields and Galois Theory (A) in preparation for Pure Mathematics 4. Note that third year Advanced units that have not been taken for credit in third year are generally available in 4th year. Further details are given in the Pure Mathematics 4 handbook.

§10. Entry Requirements for 4th Year Mathematical Statistics

The entry qualification for Mathematical Statistics 4 is a Credit average or better taken over **24 credit points of Senior Mathematical Statistics units**, and is subject to the approval of the Head of School. In addition, all Faculty requirements must have been satisfied. Students intending to do Honours in Mathematical Statistics should complete all available Advanced level Senior Statistics units of study. Interested students should see the Mathematical Statistics 4 Coordinator, Dr Rafał Kulik, Carslaw room 818, telephone 9356 7878.

§11. Attendance Requirement

Students are expected to attend all lectures and tutorials in the units in which they are enrolled. Students who are unable to comply with this requirement should seek immediate advice from one of the coordinators.

§12. Change of Enrolment – Important Dates

Withdrawing from a unit in which you have enrolled without incurring HECS charges is permitted during the first few weeks of semester only, up to the HECS census dates. Please note that students are generally not permitted to enrol in additional units after the first two weeks of each semester. It is **your** responsibility to make any desired changes in your enrolment before the appropriate dates. Changes must be made at your Faculty office.

Chapter 2. Applied Mathematics Units of Study

This chapter contains descriptions of units of study in the Applied Mathematics program, arranged by semester. Students who wish to take an advanced unit of study and who have not previously undertaken advanced level work in second year should speak to one of the coordinators and be prepared to devote extra time to the unit to compensate.

It should be noted that these lists are provisional only and that any unit of study may be withdrawn due to resource constraints.

Semester 1

Mathematical Computing (Advanced and Normal)

Differential Equations and Biomathematics (Normal)

Differential Equations and Biomathematics (Advanced)

Lagrangian and Hamiltonian Dynamics (Advanced)

Semester 2

Financial Mathematics (Advanced and Normal)

Partial Differential Equations and Waves (Advanced and Normal)

Complex Analysis with Applications (Advanced)

Fluid Dynamics (Advanced)

§1. Applied Mathematics – Semester 1 Units

MATH3076/3976 *Mathematical Computing (Normal and Advanced)*

Lecturer: Dr D. J. Ivers

*Prerequisites (*MATH3076*): 12 credit points of intermediate mathematics, and at least one of* MATH1001*,* MATH1901*,* MATH1003*,* MATH1903 *or* MATH1907*.*

*Prerequisites (*MATH3976*): 12 credit points of intermediate mathematics, and* MATH 1903 *or* MATH1907*, or a Credit in* MATH1003.

Prohibitions: MATH3016*,* MATH3916.

This unit of study provides an introduction to Fortran 95 programming and numerical methods. Topics covered include computer arithmetic and computational errors, systems of linear equations, interpolation and approximation, solution of nonlinear equations, quadrature, initial value problems for ordinary differential equations and boundary value problems.

MATH 3063 ***Differential Equations and Biomathematics (Normal)***

Lecturer: Dr A. M. Nelson
Prerequisite: 12 credit points of intermediate mathematics.
Assumed knowledge: MATH 2061.
Prohibitions: MATH 3003, MATH 3923, MATH 3020, MATH 3920, MATH 3963.

This unit of study is an introduction to the theory of systems of ordinary differential equations. Such systems model many types of phenomena in engineering, biology and the physical sciences. The emphasis will not be on finding explicit solutions, but instead on the qualitative features of these systems, such as stability, instability and oscillatory behaviour. The aim is to develop a good geometrical intuition into the behaviour of solutions to such systems. Some background in linear algebra, and familiarity with concepts such as limits and continuity, will be assumed. The applications in this unit will be drawn from predator-prey systems, transmission of diseases, chemical reactions, beating of the heart and other equations and systems from mathematical biology.

MATH 3963 ***Differential Equations and Biomathematics (Advanced)***

Lecturer: Dr M. Wechselberger
Prerequisite: 12 credit points of intermediate mathematics.
Assumed knowledge: MATH 2961.
Prohibitions: MATH 3003, MATH 3923, MATH 3020, MATH 3920, MATH 3063.

The theory of ordinary differential equations is a classical topic going back to Newton and Leibniz. It comprises a vast number of ideas and methods of different nature. The theory has many applications and stimulates new developments in almost all areas of mathematics. The applications in this unit will be drawn from predator-prey systems, transmission of diseases, chemical reactions, beating of the heart and other equations and systems from mathematical biology. The emphasis is on qualitative analysis including phase-plane methods, bifurcation theory and the study of limit cycles. The more theoretical part includes existence and uniqueness theorems, stability analysis, linearization, hyperbolic critical points and omega limit sets.

MATH 3977 ***Lagrangian and Hamiltonian Dynamics (Advanced)***

Lecturer: Dr L. Poladian
Prerequisite: 12 credit points of intermediate mathematics with an average grade of Credit or better.
Prohibitions: MATH 2904, MATH 2004, MATH 3917.

This unit provides a comprehensive treatment of dynamical systems using the mathematically sophisticated framework of Lagrange and Hamilton. This formulation of classical mechanics generalizes elegantly to modern theories of relativity and quantum mechanics. The unit develops dynamical theory from the Principle of Least Action using the calculus of variations. Emphasis is placed on the relation between the symmetry and invariance properties of the Lagrangian and Hamiltonian functions and conservation laws. Coordinate and canonical transformations are introduced to make apparently complicated dynamical problems appear very simple. The unit will also explore connections between geometry and different physical theories beyond classical mechanics.

Students will be expected to solve fully dynamical systems of some complexity including planetary motion and to investigate stability using perturbation analysis. Hamilton-Jacobi theory will be used to elegantly solve problems ranging from geodesics (shortest path between two points) on curved surfaces to relativistic motion in the vicinity of black holes.

This unit is a useful preparation for units in dynamical systems and chaos, and complements units in differential equations, quantum theory and general relativity.

§2. Applied Mathematics – Semester 2 units

MATH3075/3975 *Financial Mathematics (Normal and Advanced)*

Lecturer: Dr P. W. Buchen
*Prerequisite (*MATH3075*): 12 credit points of intermediate mathematics.*
*Prerequisite (*MATH3975*): 12 credit points of intermediate mathematics with an average grade of Credit or better.*
Prohibitions: MATH3015*,* MATH3933*.*

This unit is an introduction to the mathematical theory of modern finance. Topics include: notion of arbitrage, pricing riskless securities, risky securities, utility theory, fundamental theorems of asset pricing, complete markets, introduction to options, binomial option pricing model, discrete random walks, Brownian motion, derivation of the Black-Scholes option pricing model, extensions and introduction to pricing exotic options, credit derivatives. A strong background in mathematical statistics and partial differential equations is an advantage, but is not essential. Students completing this unit have been highly sought by the finance industry, which continues to need graduates with quantitative skills.

Note that students enrolled in MATH3075 and those enrolled in the advanced level unit MATH3975 attend the same lectures, but the assessment tasks for MATH3975 are more challenging than those for MATH3075.

MATH3078/3978 *Partial Differential Equations and Waves (Normal and Advanced)*

Lecturer: Dr R. Thompson
*Prerequisite (*MATH3078*): 12 credit points of intermediate mathematics.*
*Prerequisite (*MATH3978*): 12 credit points of intermediate mathematics with an average grade of Credit or better.*
Assumed knowledge: MATH2061 *(or* MATH2961*) and* MATH2065 *(or* MATH2965*).*
Prohibitions: MATH3018*,* MATH3921*.*

This unit of study introduces Sturm-Liouville eigenvalue problems and their role in finding solutions to boundary value problems. Analytical solutions of linear PDEs are found using separation of variables and integral transform methods. Three of the most important equations of mathematical physics – the wave equation, the diffusion (heat) equation and Laplace's equation – are treated, together with a range of applications. There is particular emphasis on wave phenomena, with an introduction to the theory of sound waves and water waves.

MATH3964 *Complex Analysis with Applications (Advanced)[*Not offered in 2009*]*

> *Lecturer: Dr K-F. Lai*
> *Prerequisite: 12 credit points of intermediate mathematics with an average grade of Credit or better.*
> *Assumed knowledge:* MATH2962.
> *Prohibitions:* MATH3904, MATH3915.

This unit continues the study of functions of a complex variable and their applications introduced in the second year unit Real and Complex Analysis (MATH2962). It is aimed at highlighting certain topics from analytic function theory and the analytic theory of differential equations that have intrinsic beauty and wide applications. This part of the analysis of functions of a complex variable will form a very important background for students in applied and pure mathematics, physics, chemistry and engineering.
The course will begin with a revision of the properties of analytic functions and Cauchy's theorem with added topics not covered in the second year course. This will be followed by meromorphic functions, entire functions, harmonic functions, elliptic functions, theta functions, analytic differential equations, and hypergeometric functions. The rest of the course will consist of selected topics from Green's functions, complex differential forms and Riemann surfaces.

MATH3974 *Fluid Dynamics (Advanced)*

> *Lecturer: Dr D. J. Galloway*
> *Prerequisite: 12 credit points of intermediate mathematics with an average grade of Credit or better.*
> *Assumed knowledge:* MATH2961 *and* MATH2965.
> *Prohibitions:* MATH3914.

This unit of study provides an introduction to fluid dynamics, starting with a description of the governing equations and the simplifications gained by using stream functions or potentials. It develops elementary theorems and tools, including Bernoulli's equation, the role of vorticity, the vorticity equation, Kelvin's circulation theorem, Helmholtz's theorem, and an introduction to the use of tensors. Topics covered include viscous flows, lubrication theory, boundary layers, potential theory, and complex variable methods for 2-D airfoils. The unit concludes with an introduction to hydrodynamic stability theory and the transition to turbulent flow.

Chapter 3. Pure Mathematics Units of Study

This chapter contains descriptions of units in the Pure Mathematics program, arranged by semester. Students who wish to take an advanced unit of study and who have not previously undertaken advanced level work in second year should speak to one of the coordinators and be prepared to devote extra time to the unit to compensate.

It should be noted that these lists are provisional only and that any unit may be withdrawn due to resource constraints.

Semester 1

Algebra and Number Theory (Normal)
Logic and Foundations (Normal)
Differential Equations and Biomathematics (Normal)
Metric Spaces (Advanced)
Rings, Fields and Galois Theory (Advanced)
Differential Equations and Biomathematics (Advanced)

Semester 2

Geometry and Topology (Normal)
Information and Coding Theory (Normal)
Analysis (Normal)
Measure Theory and Fourier Analysis (Advanced)
Differential Geometry (Advanced)
Complex Analysis with Applications (Advanced)
Modules and Group Representations (Advanced)

§1. Pure Mathematics – Semester 1 Units

MATH3062 *Algebra and Number Theory (Normal)*

> *Lecturers: Ms J. Henderson (Algebra) and TBA (Number Theory).*
> *Prerequisite: 12 credit points of intermediate mathematics.*
> *Assumed knowledge:* MATH2068 *(or* MATH2968*) recommended but not essential.*
> *Prohibitions:* MATH3002*,* MATH3902*,* MATH3962*,* MATH3009*.*

The first half of the unit continues the study of elementary number theory, with an emphasis on the solution of Diophantine equations (for example, finding all integer squares which are one more than twice a square). Topics include the Law of Quadratic Reciprocity, representing an integer as the sum of two squares, and continued fractions. The second half of the unit introduces the abstract algebraic concepts which arise naturally in this context: rings, fields, irreducibles, and unique factorization. Polynomial rings, algebraic numbers, and constructible numbers are also discussed.

MATH3065 *Logic and Foundations (Normal)*

Lecturers: Dr H. M. Gastineau-Hills
Prerequisite: 6 credit points of intermediate mathematics.
Prohibitions: MATH3005.

This unit is in two halves. The first half provides a working knowledge of the propositional and predicate calculi, discussing techniques of proof, consistency, models and completeness. The second half discusses notions of computability by means of Turing machines (simple abstract computers). (No knowledge of computer programming is assumed.) It is shown that there are some mathematical tasks (such as the halting problem) that cannot be carried out by any Turing machine. Results are applied to first-order Peano arithmetic, culminating in Gödel's Incompleteness Theorem: any statement that includes first-order Peano arithmetic contains true statements that cannot be proved in the system. A brief discussion is given of Zermelo-Fraenkel set theory (a candidate for the foundations of mathematics), which still succumbs to Gödel's Theorem.

MATH3063 *Differential Equations and Biomathematics (Normal)*

Lecturer: Dr A. M. Nelson
Prerequisite: 12 credit points of intermediate mathematics.
Assumed knowledge: MATH2061.
Prohibitions: MATH3003, MATH3923, MATH3020, MATH3920, MATH3963.

This unit of study is an introduction to the theory of systems of ordinary differential equations. Such systems model many types of phenomena in engineering, biology and the physical sciences. The emphasis will not be on finding explicit solutions, but instead on the qualitative features of these systems, such as stability, instability and oscillatory behaviour. The aim is to develop a good geometrical intuition into the behaviour of solutions to such systems. Some background in linear algebra, and familiarity with concepts such as limits and continuity, will be assumed. The applications in this unit will be drawn from predator-prey systems, transmission of diseases, chemical reactions, beating of the heart and other equations and systems from mathematical biology.

MATH3961 *Metric Spaces (Advanced)*

Lecturer: Dr J. A. Hillman
Prerequisite: 12 credit points of intermediate mathematics.
Assumed knowledge: MATH2961 *or* MATH2962.
Prohibitions: MATH3901, MATH3001.

Topology, developed at the end of the 19th Century to investigate the subtle interaction of analysis and geometry, is now one of the basic disciplines of mathematics. A working knowledge of the language and concepts of topology is essential in fields as diverse as algebraic number theory and non-linear analysis. This unit develops the basic ideas of topology using the example of metric spaces to illustrate and motivate the general theory. Topics covered include: metric spaces, convergence, completeness and the contraction mapping theorem; metric topology, open and closed subsets; topological spaces, subspaces, product spaces; continuous mappings and homeomorphisms; compact spaces; connected spaces; Hausdorff spaces and normal spaces. Applications include the implicit function theorem, chaotic dynamical systems and an introduction to Hilbert spaces and abstract Fourier series.

MATH3962 *Rings, Fields and Galois Theory (Advanced)*

Lecturer: A/Prof R. B. Howlett
Prerequisite: 12 credit points of intermediate mathematics.
Assumed knowledge: MATH2961.
Recommended prior study: MATH2968.
Prohibitions: MATH3902, MATH3002, MATH3062.

This unit of study investigates the modern mathematical theory that was originally developed for the purpose of studying polynomial equations. The philosophy is that it should be possible to factorize any polynomial into a product of linear factors by working over a "large enough" field (such as the field of all complex numbers). Viewed like this, the problem of solving polynomial equations leads naturally to the problem of understanding extensions of fields. This in turn leads into the area of mathematics known as Galois theory.
The basic theoretical tool needed for this program is the concept of a ring, which generalizes the concept of a field. The course begins with examples of rings, and associated concepts such as subrings, ring homomorphisms, ideals and quotient rings. These tools are then applied to study quotient rings of polynomial rings. The final part of the course deals with the basics of Galois theory, which gives a way of understanding field extensions.

MATH3963 *Differential Equations and Biomathematics (Advanced)*

Lecturer: Dr M. Wechselberger
Prerequisite: 12 credit points of intermediate mathematics.
Assumed knowledge: MATH2961.
Prohibitions: MATH3003, MATH3923, MATH3020, MATH3920, MATH3063.

The theory of ordinary differential equations is a classical topic going back to Newton and Leibniz. It comprises a vast number of ideas and methods of different nature. The theory has many applications and stimulates new developments in almost all areas of mathematics. The applications in this unit will be drawn from predator-prey systems, transmission of diseases, chemical reactions, beating of the heart and other equations and systems from mathematical biology. The emphasis is on qualitative analysis including phase-plane methods, bifurcation theory and the study of limit cycles. The more theoretical part includes existence and uniqueness theorems, stability analysis, linearization, hyperbolic critical points and omega limit sets.

§2. Pure Mathematics – Semester 2 Units

MATH 3061 *Geometry and Topology (Normal)*

Lecturers: Ms J. Henderson and Dr E. E. Carberry
Prerequisite: 12 credit points of intermediate mathematics.
Prohibitions: MATH 3006, MATH 3001.

The aim of the unit is to expand visual/geometric ways of thinking. The geometry section is concerned mainly with transformations of the Euclidean plane (that is, bijections from the plane to itself), with a focus on the study of isometries (proving the classification theorem for transformations which preserve distances between points), symmetries (including the classification of frieze groups) and affine transformations (transformations which map lines to lines). The basic approach is via vectors and matrices, emphasizing the interplay between geometry and linear algebra. The study of affine transformations is then extended to the study of collineations in the real projective plane, including collineations which map conics to conics. The topology section considers graphs, surfaces and knots from a combinatorial point of view. Key ideas such as homeomorphism, subdivision, cutting and pasting and the Euler invariant are introduced first for graphs (1-dimensional objects) and then for triangulated surfaces (2-dimensional objects). The classification of surfaces is given in several equivalent forms. The problem of colouring maps on surfaces is interpreted via graphs. The main geometric fact about knots is that every knot bounds a surface in 3-space. This is proved by a simple direct construction, and is then used to show that every knot is a sum of prime knots.

MATH 3067 *Information and Coding Theory (Normal)*

Lecturers: A/Prof R. B. Howlett and TBA
Prerequisite: 12 credit points of intermediate mathematics.
Prohibitions: MATH 3007, MATH 3010.

The related theories of information and coding provide the basis for reliable and efficient storage and transmission of digital data, including techniques for data compression, digital broadcasting and broadband internet connectivity. The first part of this unit is a general introduction to the ideas and applications of information theory, where the basic concept is that of entropy. This gives a theoretical measure of how much data can be compressed for storage or transmission. Information theory also addresses the important practical problem of making data immune to partial loss caused by transmission noise or physical damage to storage media. This leads to the second part of the unit, which deals with the theory of error-correcting codes. We develop the algebra behind the theory of linear and cyclic codes used in modern digital communication systems such as compact disk players and digital television.

MATH3068 *Analysis (Normal)*

Lecturer: Dr D. I. Cartwright

Prerequisite: 12 credit points of intermediate mathematics.

Prohibitions: MATH3008, MATH2007, MATH2907, MATH2962.

Analysis grew out of calculus, which leads to the study of limits of functions, sequences and series. The aim of the unit is to present enduring beautiful and practical results that continue to justify and inspire the study of analysis. This course will be useful not just to students of mathematics but also to engineers and scientists, and to future school mathematics teachers, because we shall explain why common practices in the use of calculus are correct, and understanding this is important for correct applications and explanations. The unit has three parts: the foundations of calculus, the theory of Fourier series, and complex analysis.

The first part starts with a study of the limiting behaviour of sequences and series of numbers and of functions, and the relationship between limits, differentiation and integration. This is followed by a discussion of the construction and properties of elementary functions like the sine functions and the exponential functions. As a beautiful application we shall study study the Euler MacLaurin formula, a method of summation using Bernoulli polynomials.

In the second part we investigate Fourier series; these provide examples of infinite series of functions, as studied in the first part. The theory of Fourier series is an important tool in the study of periodic phenomena, such as wave motion. The theory is studied in detail, with proofs given for some of the most famous theorems, such as Dirichlet's theorem on pointwise convergence, Bessel's inequalities, Fejer's theorem and Parseval's identity. We shall use Fourier series to calculate some special values of the Riemann zeta function, and also to solve a boundary value problem.

The third part begins with the definition of complex numbers and functions of a complex variable. We shall study the topology of the complex plane, and also introduce general notions of topology. We shall study the basic properties of differentiation with respect to a complex variable, theory of power series, exponential functions and trigonometric functions of a complex variable, complex line integrals, Cauchy's theorem, Cauchy's integral formula, residues and calculations of integrals, Moreras' theorem, Weierstrass' theorem and the famous Riemann zeta function.

Recommended reference books

A Friendly Introduction to Analysis, by W. A. J. Kosmala, Pearson Prentice Hall International Edition.

Fourier series and boundary value problems, by Ruel V. Churchill, James Ward Brown. Publisher, New York: McGraw-Hill.

Complex variables and applications, by Ruel V. Churchill, James Ward Brown. Publisher, New York: McGraw-Hill.

MATH3964 ***Complex Analysis with Applications (Advanced)*****[Not offered in 2009]**

Lecturers: Dr E. E. Carberry and Dr C. M. Cosgrove
Prerequisite: 12 credit points of intermediate mathematics with an average grade of Credit or better.
Assumed knowledge: MATH2962.
Prohibitions: MATH3904, MATH3915.

This unit continues the study of functions of a complex variable and their applications introduced in the second year unit Real and Complex Analysis (MATH2962). It is aimed at highlighting certain topics from analytic function theory and the analytic theory of differential equations that have intrinsic beauty and wide applications. This part of the analysis of functions of a complex variable will form a very important background for students in applied and pure mathematics, physics, chemistry and engineering.
The course will begin with a revision of the properties of analytic functions and Cauchy's theorem with added topics not covered in the second year course. This will be followed by meromorphic functions, entire functions, harmonic functions, elliptic functions, theta functions, analytic differential equations, and hypergeometric functions. The rest of the course will consist of selected topics from Green's functions, complex differential forms and Riemann surfaces.

MATH3966 ***Modules and Group Representations (Advanced)***

Lecturers: Dr A. Henderson
Prerequisite: 12 credit points of intermediate mathematics.
Assumed knowledge: MATH3962.
Prohibitions: MATH3907, MATH3906.

This unit deals first with generalized linear algebra, in which the field of scalars is replaced by an integral domain. In particular we investigate the structure of modules, which are the analogues of vector spaces in this setting, and which are of fundamental importance in modern pure mathematics. Applications of the theory include the solution over the integers of simultaneous equations with integer coefficients and analysis of the structure of finite abelian groups.
In the second half of this unit we focus on linear representations of groups. A group occurs naturally in many contexts as a symmetry group of a set or space. Representation theory provides techniques for analysing these symmetries. This component will deal with the decomposition of a representation into simple constituents, the remarkable theory of characters, and orthogonality relations which these characters satisfy.

MATH3968 ***Differential Geometry (Advanced)*****[Not offered in 2008]**

Lecturer: Dr E. E. Carberry
Prerequisite: 12 credit points of intermediate mathematics, including MATH2961.
Assumed knowledge: at least 6 credit points of Advanced level senior or intermediate mathematics.
Prohibitions: MATH3903.

This unit is an introduction to Differential Geometry, using ideas from calculus of several variables to develop the mathematical theory of geometrical objects such as curves, surfaces and their higher-dimensional analogues. Differential geometry also plays an important part in both classical and modern theoretical physics. The initial aim is to develop geometrical ideas such as curvature in the context of curves and surfaces in space, leading to the famous Gauss-Bonnet formula relating the curvature and topology of a surface. A second aim is to present the calculus of differential forms as the natural setting for the key ideas of vector calculus, along with some applications.

MATH 3969 ***Measure Theory and Fourier Analysis (Advanced)***

Lecturer: Dr D. I. Cartwright
Prerequisite: 12 credit points of intermediate mathematics.
Assumed knowledge: at least 6 credit points of Advanced level senior or intermediate mathematics.
Prohibitions: MATH 3909.

Measure theory is the study of such fundamental ideas as length, area, volume, arc length and surface area. It is the basis for the integration theory used in advanced mathematics since it was developed by Henri Lebesgue in about 1900. Moreover, it is the basis for modern probability theory. The course starts by setting up measure theory and integration, establishing important results such as Fubini's Theorem and the Dominated Convergence Theorem which allow us to manipulate integrals. This is then applied to Fourier Analysis, and results such as the Inversion Formula and Plancherel's Theorem are derived. Probability Theory is then discussed, with topics including independence, conditional probabilities, and the Law of Large Numbers.

Chapter 4. Mathematical Statistics Units of Study

This chapter contains descriptions of units of study in the Mathematical Statistics program, arranged by semester.
It should be noted that these lists are provisional and that any unit of study may be withdrawn due to resource constraints.

Semester 1
Stochastic Processes and Time Series (Advanced and Normal)
Applied Linear Models (Advanced and Normal)

Semester 2
Statistical Inference (Advanced and Normal)
Applied Statistics (Advanced and Normal)

§1. Mathematical Statistics – Semester 1 Units

STAT 3011 *Stochastic Processes and Time Series (Normal)*

Lecturers: Dr M. S. Peiris and Prof. E. Seneta
Prerequisites: STAT 2011 *or* STAT 2911 *or* STAT 2001 *or* STAT 2901, *and* MATH 1003 *or* MATH 1903 *or* MATH 1907.
Prohibitions: STAT 3911, STAT 3003, STAT 3903, STAT 3005, STAT 3905.

Section I of this course will introduce the fundamental concepts of applied stochastic processes and Markov chains used in financial mathematics, mathematical statistics, applied mathematics and physics. Section II of the course establishes some methods of modelling and analysing situations which depend on time. Fitting ARMA models for certain time series are considered from both theoretical and practical points of view. Throughout the course we will use the S-PLUS (or R) statistical packages to give analyses and graphical displays.
There will be 3 lectures and 1 tutorial per week, and a total of 10 computer lab sessions in the semester.

STAT 3911 *Stochastic Processes and Time Series (Advanced)*

Lecturers: Dr M. S. Peiris and Prof. E. Seneta
Prerequisites: STAT 2911 *or Credit in* STAT 2901, *and* MATH 1003 *or* MATH 1903 *or* MATH 1907.
Prohibitions: STAT 3011, STAT 3003, STAT 3903, STAT 3005, STAT 3905.

This is an Advanced version of STAT 3011. There will be 3 lectures in common with STAT 3011. In addition to STAT 3011 material, theory on branching processes and birth and death processes will be covered. There will be more advanced tutorial and assessment work associated with this unit.

There will be 3 lectures and 1 tutorial per week, plus an extra lecture on advanced material in the first half of the semester. There will be 7 computer lab sessions (on time series) in the second half of the semester.

STAT 3012 *Applied Linear Models (Normal)*

> *Lecturers: Dr M. Stewart and Prof N. C. Weber*
> *Prerequisites:* STAT 2012 *or* STAT 2912 *or* STAT 2004, *and* MATH 1002 *or* MATH 1902.
> *Prohibitions:* STAT 3002, STAT 3004, STAT 3902, STAT 3904, STAT 3912.

This course will introduce the fundamental concepts of analysis of data from both observational studies and experimental designs using classical linear methods, together with concepts of collection of data and design of experiments. First we will consider linear models and regression methods with diagnostics for checking appropriateness of models. We will look briefly at robust regression methods here. Then we will consider the design and analysis of experiments considering notions of replication, randomization and ideas of factorial designs. Throughout the course we will use the S-PLUS (or R) statistical packages to give analyses and graphical displays.

STAT 3912 *Applied Linear Models (Advanced)*

> *Lecturers: Dr M. Stewart and Prof N. C. Weber*
> *Prerequisites:* STAT 2912 *or Credit in* STAT 2004, *and* MATH 1902 *or* MATH 2061 *or* MATH 2961.
> *Prohibitions:* STAT 3002, STAT 3004, STAT 3902, STAT 3904, STAT 3012.

This course will introduce the fundamental concepts of analysis of data from both observational studies and experimental designs using classical linear methods, together with concepts of collection of data and design of experiments. First we will consider linear models and regression methods with diagnostics for checking appropriateness of models. We will look briefly at robust regression methods here. Then we will consider the design and analysis of experiments considering notions of replication, randomization and ideas of factorial designs. Throughout the course we will use the S-PLUS (or R) statistical packages to give analyses and graphical displays.
There will be 3 lectures, 1 tutorial and 1 computer laboratory session per week.

§2. Mathematical Statistics – Semester 2 Units

STAT 3013 *Statistical Inference (Normal)*

> *Lecturer: Dr M. Raimondo*
> *Prerequisite:* STAT 2012 *or* STAT 2912 *or* STAT 2003 *or* STAT 2903.
> *Prohibitions:* STAT 3001, STAT 3901, STAT 3913.

In this course we will study basic topics in modern statistical inference. This will include traditional concepts of mathematical statistics: likelihood estimation, method of moments, properties of estimators, exponential families, decision-theory approach to hypothesis testing, likelihood ratio test, as well as more recent approaches such as Bayes estimation, Empirical Bayes and nonparametric estimation. During the weekly computer classes (using S-PLUS or R software packages) we will illustrate the various estimation techniques and give an introduction to computationally intensive methods like Monte Carlo, Gibbs sampling and EM-algorithm.

There will be 3 lectures, 1 tutorial and 1 computer laboratory session per week.

STAT 3913 *Statistical Inference (Advanced)*

Lecturer: Dr M. Raimondo

Prerequisite: STAT 2912 *or* STAT 2903.

Prohibitions: STAT 3001, STAT 3901, STAT 3013.

This unit is essentially an Advanced version of STAT 3013, with emphasis on the mathematical techniques underlying statistical inference together with proofs based on distribution theory. There will be 3 lectures per week in common with some material required only in this advanced course and some advanced material given in a separate advanced tutorial together with more advanced assessment work.

There will be 3 lectures, 1 tutorial and 1 computer laboratory session per week.

STAT 3014 *Applied Statistics (Normal)*

Lecturers: Prof N. C. Weber and Dr Y. H. Yang

Prerequisite: STAT 2012 *or* STAT 2912 *or* STAT 2004.

Assumed Knowledge: STAT 3012 *or* STAT 3912.

Prohibitions: STAT 3914, STAT 3006, STAT 3002, STAT 3902.

This unit has three distinct but related components: multivariate analysis, sampling and surveys, and generalized linear models. The first component deals with multivariate data covering simple data reduction techniques like principal components analysis and core multivariate tests including Hotelling's $T2$, Mahalanobis' distance, and Multivariate Analysis of Variance (MANOVA). The sampling section includes sampling without replacement, stratified sampling, ratio estimation, and cluster sampling. The final section looks at the analysis of categorical data via generalized linear models. Logistic regression and log-linear models will be looked at in some detail along with special techniques for analyzing discrete data with special structure.

There will be 3 lectures, 1 tutorial and 1 computer laboratory session per week.

STAT 3914 ***Applied Statistics (Advanced)***

Lecturers: Prof N. C. Weber and Dr Y. H. Yang
Prerequisite: STAT 2912 *or Credit or better in* STAT 2004*.*
Assumed Knowledge: STAT 3912*.*
Prohibitions: STAT 3014*,* STAT 3006*,* STAT 3002*,* STAT 3902*,* STAT 3907*.*

This unit is an Advanced version of STAT 3014. There will be 3 lectures per week in common with STAT 3014. The unit will have extra lectures focusing on multivariate distribution theory developing results for the multivariate normal, partial correlation, the Wishart distribution and Hotelling's $T2$. There will also be more advanced tutorial and assessment work associated with this unit.
There will be 3 lectures, 1 tutorial and 1 computer laboratory session per week.

Chapter 5. Examinations and Assessment

§1. Examinations, Assessment and Grades

Examinations in senior Mathematics units of study are two hours in length, and are held in the examination period at the end of the semester in which the unit is offered. Statistics units have three hour examinations. Locations and seating details will be available on the web via MyUni. Examination timetables should be carefully checked in case of clashes. Clashes must be reported immediately to the Student Centre.

In each of the senior units in Mathematics and Statistics, the final assessment will be based on a mix of exam marks and marks for work assessed during the semester (assignments, quizzes, tutorial participation, etc.). The precise arrangements for each unit will be provided in an Information Sheet distributed by the lecturer in the first week of the semester.

After final marks have been calculated, an examiners' meeting decides pass, credit, distinction and high distinction marks for each unit of study, and scaling is then carried out so that each student receives a score out of 100.

A score in the range 85 to 100 is a High Distinction,
A score in the range 75 to 84 is a Distinction,
A score in the range 65 to 74 is a Credit,
A score in the range 50 to 64 is a Pass.

Note 1: High Distinctions may be awarded in Normal level units as well as Advanced level units, for students of sufficient merit. It is expected, however, that there will be a considerably larger percentage of High Distinctions awarded in Advanced units than in Normal units.

Note 2: Students who receive a mark below 50 in any unit of study are strongly advised to see one of the coordinators as soon as possible to discuss their overall progress.

§2. Special Consideration and Special Arrangements

The School of Mathematics and Statistics policy concerning requests for special consideration and special arrangements for assessment is available on the web at
http://www.maths.usyd.edu.au/u/UG/SpecialConsideration.html
The policy should be read in conjunction with the general university policy on Assessment and Examination of Coursework.

§3. Results

At the end of each semester results are mailed to students by the University Registrar, and are also available via MyUni. Any progressive assessment marks which may be released by the School of Mathematics and Statistics prior to this are provisional only, and may be modified by either the School or by the Registrar before they become final.

§4. Timetabling Problems

Students with timetabling or other administrative problems that affect their attendance at lectures, tutorials and lab sessions should contact the appropriate coordinator at the beginning of each semester. This advice is of particular relevance to any students in the Education Faculty who are absent from the university on teaching practice.

Chapter 6. Additional Information

§1. Tutorials

All students enrolled in senior mathematics and statistics units are expected to attend the scheduled tutorials for each unit. Tutorial exercise sheets are usually given out during the lectures, and you are expected to prepare for the tutorials by reading the relevant lecture note material and attempting as many exercises as possible. During the tutorial sessions, your tutor will answer questions from the class, give hints on exercises and generally guide you through the tutorial. The more work you do beforehand, the more your tutor is likely to be able to help you.

Tutorials generally begin in the second week of the semester, although some statistics tutorials and computer practical classes begin in Week 1. Students will be allocated to tutorials by the university timetabling unit. Personal timetables for all students enrolled in senior mathematics and statistics units will be available via MyUni at the beginning of each semester.

§2. Assignments

Skills and understanding cannot be acquired passively, for example by attendance at lectures and tutorials alone. On the contrary, it is essential that you do as many relevant problems as possible during each semester, for it is only by solving problems by your own initiative that you will attain mastery.

For this reason, sets of assignment exercises on the current lectures will be issued regularly to each student, collected, marked and returned (to the extent that resources permit) with corrections and comments. To facilitate this, you are asked to adhere to some guidelines for the assignments you submit.

Solutions 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* or *pinned* to a manilla folder, on the cover of which you should write in *block letters* your *name* and *faculty*. Slide-on paper clips are unsuitable fasteners as they catch on other folders and are pulled off. Only one assignment is to be enclosed in the folder at a time.

Collaboration on Assignments

Plagiarism can be broadly defined as knowingly presenting another person's ideas, findings or work as one's own by copying or reproducing the work without due acknowledgement of the source (for example, copying a significant portion of an assignment from the work of another student). Plagiarism is an unacceptable practice.

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 with friends on a general level, provided everybody involved makes some contribution. However, each student should produce his or her 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. Cases of suspected plagiarism may be referred to the University Registrar. All students should read the **University policy on plagiarism** (and possibly other **University documents relating to teaching and learning policy and procedures**).

§3. Quizzes and Participation Marks

If you are taking a unit 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 units in which you are enrolled.

§4. Consultations

General questions about administration should be taken to one of the coordinators. Questions about content should be discussed with your lecturer or a tutor as soon as possible, usually during scheduled consultation hours or tutorials. Lecturers will notify students of their scheduled consultation hours during the first week of each semester.

§5. Solutions to Tutorials and Assignments

At the discretion of the lecturer, photocopies of solutions to tutorial and assignment problems may be made available at specified times, from either

KOPYSTOP, 55 Mountain St, Broadway, or

UNIVERSITY COPY CENTRE, Ground Floor, Noel Martin Recreation Centre.

Your lecturer will announce which venue is to be used. Solutions may also be made available on the course web page.

§6. Noticeboards

The noticeboard for senior units in applied mathematics is located on Level 6 of the Carslaw Building, next to Room 627. The noticeboard for senior units in pure mathematics is located on Level 5 of the Carslaw Building, next to Room 524. The noticeboard for senior units in statistics is located on Level 8 of the Carslaw Building, opposite the lifts. Students should consult the noticeboards regularly.

§7. Careers Advice and Information

We would like to draw your attention to the assistance which can be obtained from the University's **Careers Centre**. Final year students, in particular, are advised to contact the Centre early in the year. They will be able to give help in setting career goals, assistance in writing résumés and in preparing for job interviews, and up-to-date information about the job market. The Careers Centre is located in the Mackie Building, telephone 9351-3481.

§8. Sydney University Mathematical Society

ΣUMS (pronounced sums) is an informal group run by students that aims to promote interest in mathematics, and every mathematics student is automatically a member. ΣUMS organizes talks by students and mathematicians, an annual problem solving competition and various social gatherings. For more information visit the ΣUMS website. Everybody is very welcome to attend and be involved.