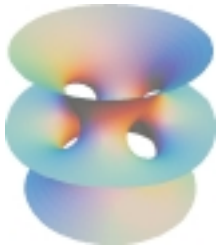
# Information for *First Year* Mathematics Students



Here is a brief description of First Year Courses for 2006.
More complete information is available online at www.maths.anu.edu.au/DoM/ .

Planning your program is important. Students who intend to take Second and Third Year courses in Mathematics, Physics, Statistics, Computer Science or Economics should study the Faculty handbook entries for those subjects carefully to ensure that they are enrolled in the Mathematics course which will provide them with the appropriate prerequisites. If you would like any further information about the mathematics courses please contact the First Year Coordinator, Elizabeth Ormerod.

## First Semester First Year Courses

**Mathematical Modelling 1: Calculus** MATH1003
Assumed knowledge: ACT Mathematical Methods or NSW HSC Mathematics or equivalent
The course will introduce calculus and matrix theory and their use in mathematical modelling. Emphasis will be placed on developing facility, technique and use in applications. Modelling of processes and phenomena which occur in economics and the physical, environmental and life sciences will be used as a vehicle throughout. This course also provides a pathway to higher level mathematics courses.
Topics to be covered include: Functions and graphs, the transcendental functions, approximation, differential equations, techniques and uses of differentiation and integration, solution of systems of linear equations, matrix algebra.
The text will be advised later.

**Mathematics and Applications 1** MATH1013
Prerequisites: MATH1003 or a satisfactory result in ACT Specialist Mathematics (Major- Minor) or NSW HSC Mathematics Extension 1 or equivalent. Students with a good pass in ACT Mathematical Methods or NSW HSC Mathematics or equivalent will be considered.

The syllabus for the Calculus section of this course (approx 24 lectures) will be: Limits, including infinite limits and limits at infinity. Continuity and global properties of continuous functions. Differentiation, transcendental functions: exponential and logarithmic functions and their connection with integration, growth and decay, hyperbolic functions. Local and absolute extrema, concavity and inflection points, Newton's method, Taylor polynomials, L'Hopital's rules. Riemann integration and the Fundamental Theorem of Calculus. Techniques of integration including the method of substitution and integration by parts.
For the Algebra section (approx 24 lectures) the syllabus will be: Complex numbers. Solution of linear equations, vector and matrix equations, linear transformations and the idea of a vector space. Emphasis on understanding and using algorithms and applications.
The texts will be R. Adams: Calculus, a complete course, and D. Lay: Linear Algebra and its Applications.

**Mathematics and Applications 1 Honours** MATH1115
Prerequisites: A satisfactory pass in the ACT Specialist Mathematics double major, NSW HSC Mathematics Extension 2 or equivalent
Lectures will cover the Calculus and Linear Algebra syllabus of MATH1013 in somewhat more depth. In addition, several variable calculus will be introduced. Lectures are organised so that it is possible to move into MATH1013 at certain points during the semester, but changes in the opposite direction are more difficult.
The texts will be as for MATH1013; further notes will be provided online.

**The Poetry of the Universe** MATH1007
This course is offered jointly with the Department of Philosophy. It treats mathematics in its broadest sense. The philosophy of mathematics and science will be discussed under four headings: the history and philosophy of mathematics and science; shape and form; from theology to cosmology; and self-organising systems. These will emphasise the evolution of thought leading to current understandings.
There are no formal prerequisites.

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## Second Semester First Year Courses

**Mathematical Modelling 2: Discrete Systems** MATH1005
Entry to this course is as for MATH1003. Note that MATH1003 is **not** a prerequisite for MATH1005.
This course is an introduction to finite mathematics and its use in mathematical modelling. Emphasis will be placed on developing facility, technique and use in applications. Topics to be covered include: combinatorics and counting, elementary probability, graphs and networks, induction and recurrence relations.
The text is S. Epp: Discrete Mathematics with Applications.

**Mathematics and Applications 1** MATH1013
Prerequisites: MATH1003 or a satisfactory result in ACT Specialist Mathematics or NSW HSC Mathematics Extension 1 or equivalent. Students with a good pass in ACT Mathematical Methods or NSW HSC Mathematics or equivalent will be considered.

The syllabus for the Calculus section of this course (approx 24 lectures) will be: Limits, including infinite limits and limits at infinity. Continuity and global properties of continuous functions. Differentiation, transcendental functions: exponential and logarithmic functions and their connection with integration, growth and decay, hyperbolic functions. Local and absolute extrema, concavity and inflection points, Newton's method, Taylor polynomials, L'Hopital's rules. Riemann integration and the Fundamental Theorem of Calculus. Techniques of integration including the method of substitution and integration by parts.
For the Algebra section (approx 24 lectures) the syllabus will be: Complex numbers. Solution of linear equations, vector and matrix equations, linear transformations and the idea of a vector space. Emphasis on understanding and using algorithms and applications.
The texts will be R. Adams: Calculus, a complete course, and D. Lay: Linear Algebra and its Applications.

**Mathematics and Applications 2** MATH1014 p
The prerequisite is MATH1013; incompatible with MATH1003.
The Calculus section will study integration and techniques of integration and functions of several variables — visualisation, continuity, partial derivatives and directional derivatives. The Algebra section will include: theory and application of Euclidean vector spaces, linear independence, bases and dimension, eigenvalues and eigenvectors, orthogonality and least squares. Applications will be discussed to processes and phenomena which occur in economics and the physical, environmental and life sciences.
The texts will be as for MATH1013.

**Mathematics and Applications 2 Honours** MATH1116
The prerequisite is MATH1115 at Credit level or better.
This course continues the development of Calculus and Linear Algebra, including some more advanced material and with a particular emphasis on the underlying foundations of mathematics.
The texts will be as for MATH1115.