



Course Outline

MATH1251 Mathematics for
Actuarial Studies and Finance 1B

School of Mathematics and Statistics

Faculty of Science

Term 2, 2022

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Note: The lecture and tutorial on Monday 13 June (Week 3) will be cancelled due to a public holiday. A recorded lecture may be provided for this. Details will be announced on Moodle close to the time.
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Tutorials

Students in MATH1251 are enrolled in a tutorial for weeks 1 to 5 and 7 to 10. There will also be some Q&A session arranged via Moodle in the first half of the week. The Q&A sessions will be online using Blackboard Collaborate. The tutorial timeslot in your timetable on myUNSW will be for the Classroom Tutorial. The Classroom Tutorial will be a mix of Algebra and Calculus each week. Note that the weekly Möbius lesson contains a poll to vote for which questions will be discussed in the Classroom Tutorial later that week.

In Term 1 2022, students can enrol in either face-to-face tutorials, or online tutorials. The face-to-face tutorials are subject to change depending on conditions within NSW. The online tutorials will use Blackboard Collaborate, a virtual classroom system. This is the same system that is used for lectures. See Moodle for details. A laptop with internet access is recommended for attending live classes online.

Attendance is compulsory for all tutorials and a roll will be taken by the tutor for face-to-face classes or automatically by Blackboard Collaborate for online classes. Selected tutorials may be recorded for students to

The weekly Möbius lessons cover topics from algebra, calculus and Matlab. You have unlimited attempts for

Schedule of all assessments

Lectures and tutorials run during weeks 1 to 5 and 7 to 10. The table below gives the schedule all assessments.

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6. Course Materials

<https://www.unsw.edu.au/science/our-schools/maths/student-life-resources/student-services/assessment-policies>

The School of Mathematics and Statistics will assume that all its students have read and understood the School policies on the above pages and any individual course policies on the Course Initial Handout and Course Home Page. Lack of knowledge about a policy will not be an excuse for failing to follow the procedure in it.

Academic Integrity and Plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW staff and students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

The UNSW Student Code provides a framework for the standard of conduct expected of UNSW students with respect to their academic integrity and behaviour. It outlines the primary obligations of students and directs staff and students to the Code and related procedures.

In addition, it is important that students understand that it is not permissible to buy essay/writing services from third parties as the use of such services constitutes plagiarism because it involves using the words or ideas of

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does not amount to plagiarism.

Students are reminded of their Rights and Responsibilities in respect to plagiarism, as set out in the University Undergraduate and Postgraduate Handbooks and are encouraged to seek advice from academic staff whenever necessary to ensure they avoid plagiarism in all its forms.

Useful resources are available at <https://www.student.unsw.edu.au/plagiarism>.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

Additional Support

ELISE (Enabling Library and Information Skills for Everyone)

- Equitable Learning Services: <https://student.unsw.edu.au/els> (formerly Disability Services Unit)
- UNSW IT Service Centre: <https://www.it.unsw.edu.au/students/index.html>

9. Applications for Special Consideration

If you are unable to complete an assessment on time or during the proscribed period due to illness or other reason beyond your control, you can apply for special consideration.

For all information on Special Consideration, including the circumstances that are covered or excluded and 9 >>6(ond)-13.

10. Algebra Lecture timetable and syllabus

The algebra course for Math1251 is based on chapters 6 to 9 of the MATH1251 Algebra Notes, which are essential reading and must be brought to all algebra tutorials. The lecturer will not cover all the material in these notes in their lectures as some sections of the notes are intended for reference and for background reading. An approximate lecture timetable is given below. The lecturer will try to keep to this timetable, but variations might be unavoidable. As in MATH1151, the computer package MATLAB will be used in the MATH1251 algebra course.

Chapter 6. Complex Numbers

Lectures 1- 6

This section covers complex numbers in Cartesian and polar forms, complex arithmetic and geometry, factorization of polynomials and stability of dynamical systems.

Development of number systems and closure. Definition of complex numbers and of complex number addition, subtraction, multiplication and division.

Equality, real and imaginary parts, complex conjugates.

Argand diagram, polar forms, modulus, argument.

De Moivre's Theorem and Euler's Formula. Arithmetic of polar forms.

Powers and roots of complex numbers. Binomial theorem and Pascal's triangle.

Trigonometry and geometry.

Complex polynomials. Fundamental theorem of algebra, factorization theorem, factorization of complex polynomials of form $ax^2 + bx + c$, real linear and quadratic factors of real polynomials.

Stability of discrete and continuous time systems.

Chapter 7. Vector Spaces

Lectures 7- 14

The aim of this section of the course is to introduce the general theory of vector spaces and to give some basic examples. The majority of examples will be for the real vector space \mathbb{R}^n , but some examples will be given for the complex vector space \mathbb{C}^n , the vector space of $n \times n$ matrices, the vector space of polynomials of degree at most n , the vector space of functions, the vector space of sequences, the vector space of distributions, the vector space of differential forms, the vector space of tensors, the vector space of symmetric tensors, the vector space of alternating tensors, the vector space of symmetric bilinear forms, the vector space of alternating bilinear forms, the vector space of symmetric trilinear forms, the vector space of alternating trilinear forms, the vector space of symmetric k -linear forms, the vector space of alternating k -linear forms, the vector space of symmetric k -tensors, the vector space of alternating k -tensors, the vector space of symmetric k -tensors of rank r , the vector space of alternating k -tensors of rank r , the vector space of symmetric k -tensors of rank r and alternating k -tensors of rank r .

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Injective, surjective and bijective linear maps.

Chapter 9 . Eigenvalues and Eigenvectors

Lectures 19- 24

The aims of this section are to introduce the ideas of eigenvalue and eigenvector and to show some applications of these ideas to diagonalization of matrices, evaluation of powers of matrices and solution of simple systems of linear differential equations. Examples for hand calculation will be restricted to 2×2 matrices and very simple 3×3 matrices, with larger problems done using MATLAB.

Definition, examples and geometric interpretation of eigenvalues and eigenvectors.

Eigenvectors, bases and diagonalization of matrices.

Applications to powers of matrices and solution of systems of linear differential equations.

Markov Chain Processes.

Problem Sets

At the end of each chapter there is a set of problems. Some of the problems are very easy, some are less easy but still routine and some are quite hard. To help you decide which problems to try first, each problem is marked with an [R], an [H] or an [X]. The problems marked [R] form a basic set of problems which you should try first. Problems marked [H] are harder and can be left until you have done the problems marked [R]. You *do* need to make an attempt at the [H] problems because problems of this type wil

Theory in the Algebra course

The theory is regarded as an essential part of this course and it will be examined both in class tests and in the end of year examination.

You should make sure that you can give DEFINITIONS of the following ideas:

Chapter 7 . Subspace of a vector space, linear combination of a set of vectors, span of a set of vectors, linear independence of a set of vectors, spanning set for a vectors space, basis for a vector space, dimension of a vector space, coordinate vector of a vector with respect to an ordered basis.

Chapter 8 . Linear function, kernel and nullity of a linear function, image and rank of a linear function.

Chapter 9 . Eigenvalue and eigenvector, diagonalizable matrix.

13. Some Greek Characters

Listed below are the Greek characters most commonly used in mathematics.

Name	Lower case	Upper case	Name	Lower case	Upper case
Alpha			Nu		
Beta			Xi		
Gamma			Pi		
Delta			Rho		
Epsilon			Sigma		
Zeta			Tau		
Eta			Phi	or	
Theta			Chi		
Kappa			Psi		
Lambda			Omega		
Mu					