

MATHS 250 SC, Advancing Mathematics 2

STUDY GUIDE Semester 2, 2011

Welcome to MATHS 250

MATHS 250 is the sequel to MATHS 150 and is intended for students with a good mathematics background who are considering a major or a minor in mathematics and/or physics. In addition, students planning a major in, for example, finance, economics, statistics, computer science or chemistry will find that their choices in those disciplines are greatly enhanced by a strong component of mathematics.

The prerequisites for MATHS 250 are: a pass in MATHS 150, PHYSICS 111, MATHS 153 or ENGSCI 111, or A or A+ in MATHS 108, or B+ or better in MATHS 208. If you do not have this background, you should immediately contact the coordinator to discuss your options.

Lecturers, office hours, lectures, and tutorials The **coordinator** for this semester and lecturer for weeks 1 – 9 is

Wendy Stratton, email w.stratton@auckland.ac.nz, telephone 373-7599 ext 85757 or 923-5757, The lecturer for weeks 10 – 12 is

David Gauld, email d.gauld@auckland.ac.nz telephone 373-7599 ext 88697 or 923-8697.

David's office is room 307, 1 – 11 Short St this semester. Wendy's is on the ground floor at 70 Symonds St, but access is restricted. You will need to make an appointment and *be on time* for your appointment in order to see her there.

Lectures are scheduled to be held at 3pm in OGH (Old Government House) on Mondays, at 1pm in OGH on Tuesdays, and at 3pm in 260-092 (Owen G Glenn 092) on Thursdays. Collaborative tutorials will start on Monday of the **second week** of semester.

Texts The prescribed texts for this course are *Calculus (Early Transcendentals)*, 8th Edition, by Howard Anton, Irl Bivens and Stephen Davis, and *Contemporary Linear Algebra*, by Howard Anton and Robert C. Busby, both published by Wiley. These books are also the required texts for Maths 253. The texts are an essential part of the course; you should read them and do plenty of examples from them in addition to completing assignments and tutorials.

Lecture outlines The lecture outlines that will be available shortly (there will be a Cecil announcement when they are) at the Student Resource Centre in G16 on the ground floor of the Maths/Physics building are an essential aid to students. They give the main definitions and theorems for each topic and refer the student to the relevant pages in the texts for further study. You should have a copy of these with you during lectures.

Lecture recordings and the **notes made in class** will be available from a link in the **Knowledge Map in Cecil**.

Coursework and assessment

Assignments There will be 4 assignments. The assignment questions will be available on the course website. Your answers should be submitted in neat writing (not in pencil or in red ink) on A4 paper using a Mathematics Department cover sheet, which is available from the Student Resource Centre. The assignments should be handed in **no later than 4 p.m** on the due date. The due dates are

Friday 5th August; Friday 26th August; Friday 23rd September; Friday 14th October.

Assignments should be posted in the appropriate Maths 250 boxes outside Sci-space on the ground floor of the Maths/Physics building, and the marked assignments will be returned to the nearby collection shelves. **Late assignments or assignments posted in the wrong box will not be marked.**

Fully worked solutions will be available on the website after the due date: these should be studied and understood, particularly where they apparently disagree with your own solutions. Extra assignments (not to be handed in) will be made available for you to work on, and their solutions will be made available.

Tutorials There will be tutorials, with short questions to be answered, every week **except the first**. You are expected to try to solve the problems given with a group of not more than 3 other students. All members of each group must discuss the problems vigorously, both to become accustomed to using the language and notation you will be learning and to help **everyone** in the group to a full understanding of the mathematics involved. The tutor should be called to help where no one in the group knows how to

proceed. Fully worked solutions will be on Cecil after each Thursday: these should be studied and understood.

Tutorials and assignments are **essential** components of this course. If you do not attend tutorials and submit assignments, then, judging by results over the last few years, you will certainly fail this course.

Test There will be a **test at 6pm on Friday September 16th**. The test is worth 30% of your final grade. If you have a clash with another test, email the coordinator well before the test date.

Final grades for **MATHS 250** will be calculated by the examiner as follows:

Assignments 10%, Tutorials 5%, Test 30%, Exam 55%.

Should you be unable to sit the exam or test because of illness or bereavement, you should immediately inform the lecturer, get a doctor's certificate covering the date and make an application for an aegrotat or compassionate consideration within 7 days. In this case you may be eligible for an aegrotat pass, but only if you sat the test or exam and passed it well and have a good assignment and tutorial record.

Matlab, calculators, studying

Matlab and Calculators All mathematics courses have access to the programming package Matlab and we expect Maths 250 students to use Matlab in some assignments. Calculators may be of occasional use in exercises, but will not be allowed in the test or final exam. Full working must be shown in order to gain full marks in **all written work**.

How to study, and getting help Begin by keeping and reading this Study Guide handed out at the first lecture. Attend lectures. Study the corresponding parts of the textbooks (given in the Course Outlines), either before the lecture or immediately after. Do the suggested exercises after each lecture. If you don't understand something, read the notes or the text again, or listen to the relevant part of the lecture again. Keep trying until it makes sense. Ask questions of each other and of your lecturer. Go to your lecturer's office hours and ask. You can contact them by email too. Start on your assignments (compulsory **and** optional) as soon as you get them. Attend tutorials and try to get into a group that has someone in it who knows what they are doing. You should also

- (1) ask questions in class,
- (2) visit the lecturer. The times (and places) for Office Hours will be posted on Cecil.
- (3) ask the tutor in the weekly tutorial.
- (4) You can also get help and advice from the tutors in the **Assistance Room** in room G16 on the ground floor of the Mathematics Building (open on weekdays from 10am to 4pm).

Warning about copying The University of Auckland will not tolerate cheating, or assisting others to cheat, and views cheating in coursework as a serious academic offence. The work that a student submits for grading must be the student's own work, reflecting his or her learning. Where work from other sources is used, it must be properly acknowledged and referenced. This requirement also applies to sources on the world-wide web. A student's assessed work may be reviewed against electronic source material using computerised detection mechanisms.

In this course, students are strongly encouraged to discuss assignment, tutorial and other problems with each other. However assignment answers should be entirely the student's own work, resulting from the understanding gained from lectures, texts and discussion. Anyone judged to have copied or to have allowed their work to be copied will be given no marks for that work and could face disciplinary action such as being banned from attending further courses. Please take this very seriously.

Course outline

Subspaces of n -dimensional Euclidean spaces, basis and dimension. Matrices as linear transformations, and elementary matrices. Revision of determinants, determinants and linear independence. Eigenvalues and eigenvectors. Matrices and modeling, and analysis of models. Linear manifolds, orthogonal complements. The 4 fundamental spaces of a matrix and the Dimension Theorem. Best approximations, least squares and curve fitting.

Integration revision. Introduction to first order differential equations. Limits of sequences. Series, and convergence tests. Power series, Taylor and Maclaurin expansions. Function of two and three variables, vector valued functions. Limits and continuity of functions of several variables. Partial derivatives. Chain Rule, gradient. Maxima and minima of functions of several variables.

We have some really nice maths to discuss, and are sure you will enjoy it too.
Wendy Stratton and David Gauld.