Department of Mathematics

Study Guide
MATHS 260 Semester 2 2010
Differential Equations

This document contains important information about the course Maths 260. Please read it carefully. You should keep this document for future reference.

Course Description
The study of differential equations is central to mathematical modelling of systems that change. This course develops methods for understanding the behaviour of solutions to ordinary differential equations. Qualitative and elementary numerical methods for obtaining information about solutions are discussed, as well as some analytical techniques for finding exact solutions in certain cases. Some applications of differential equations to scientific modelling are discussed.

Preparation for Maths 260
Before enrolling in this course, you should already have passed Maths 150 or Maths 208, or obtained an A- grade or better in Maths 108, or have passed an equivalent course. The most important prerequisite material assumed is methods for integration and differentiation, and eigenvalues and eigenvectors. Speak to your lecturer if you have any concerns about your mathematics background.

How to do well in Maths 260

- Spend at least 10 hours each week working on this course. This includes attending lectures, reading the textbook and doing assignment questions.

- Try hard not to miss lectures and tutorials. If you miss a lecture, get the lecture notes from the course website and go over them before the next lecture or tutorial. If you miss a tutorial, get a copy of the tutorial question sheet from the course website and answer the questions before the next lecture or tutorial.

- To get the most out of each lecture, review the material from the previous lecture before coming to class. You can also read any recommended sections in the textbook. These are listed on the lecture notes from the previous lecture.

- Try some of the recommended examples from the textbook. Problems appropriate to each lecture will be given during the lecture. Try some of the problems every week; don't wait until it is time to study for the exam.

- Attempt all the assignment questions. Once your assignment is marked, go over the assignment to check where you made mistakes. Sample solutions to the assignments will be posted on the course website - read them, as they contain helpful information such as alternative ways to answer questions.

- If you are having problems with material in the course, first make sure you have read the appropriate parts of the lecture notes and the textbook. Then speak to your lecturer, either in lectures or tutorials or make an appointment with your lecturer. Good ways to

make an appointment are by speaking to your lecturer after class or by emailing your lecturer. Don't be scared to approach your lecturers for help - they are happy to help students who are trying to help themselves.

- Some help with Maths 260 may also be available in the Mathematics Department assistance room (Room G16 in the Maths Building), starting from the second week of semester.

- If you need help with computer use in the computer laboratory, ask a demonstrator in the laboratory. Demonstrators on duty will be wearing a sash and there will always be a demonstrator on duty when the Maths/Stats laboratory is open. If the demonstrators are unable to help you with details of the Matlab package used, then ask your lecturer for help.

- To prepare for the test or exam, first make sure you understand your lecture notes and make sure you can do all assignment and tutorial questions. Go over some old exam papers (these can be downloaded from the University Library webpages). The recommended problems listed in lectures can be used for extra practice. If you have problems, see your lecturer.

Textbook
The text for this paper is *Differential Equations*, by P. Blanchard, R. Devaney and G. Hall (first, second or third edition).

This textbook is very good, and the course makes extensive use of the book. **You have to read the book**. There are several copies of the text on short loan in the Library. The book costs about $195.00 new after student discount. There will also be second hand copies of the text available.

CECIL and course website

Information about the content of the course will be available from the course website:

http://www.math.auckland.ac.nz/wiki/MATHS_260_Semester_2_2010_Website

This is the place to look for copies of assignments, lecture handouts and tutorial sheets, and for announcements about Maths 260.

Coursework marks and announcements about the course can be viewed by logging in to CECIL. Access Cecil at http://www.cecil.auckland.ac.nz

Use of the Undergraduate Computer Laboratory
Students will be required to use the software package Matlab in the Undergraduate Computer Laboratory to complete assignments and to do tutorial questions. A map showing you how to find the Teaching Laboratory and a brief guide to the labs can be found at:

http://www.scl.ec.auckland.ac.nz

More information about laboratory use will be distributed in lectures.

Lecturers & Contact Details
The lecturers for this course are:
Vivien Kirk (Course coordinator): Room 406 Building 303, Email: v.kirk@auckland.ac.nz
Laurence Palk: Room 422 Building 303, Email: l.palk@auckland.ac.nz

If you want to talk to your lecturer, speak to him or her after a lecture or in office hours, or make an appointment to meet at another time. Office hours will be announced in lectures and posted on the website.

Times & Rooms
The lectures are at 11am, Monday, Tuesday, and Friday. The room allocation is available on nDeva, but note that room allocations can change before or during the first weeks of semester. Check nDeva before each lecture in the first two weeks for up-to-date information.

Tutorials will be held on Wednesdays at 11am and 2pm, and on Thursdays at 9am and 11am in BTL (basement teaching laboratory, B75 in the Maths building). Tutorials start in the first week of semester. You will enrol in one of these tutorials on nDeva. It is usually not possible to attend a tutorial other than the one you are enrolled for.

Assessment
The final grade for the course will be calculated as follows:

- Exam (2 hours) 60%
- Mid-semester test 20%
- Assignments 15%
- Tutorials 5%

Four assignments will be set and marked. The assignments will be due in on the following dates: **Tuesday August 10th, Tuesday August 24th, Tuesday September 28th, and Thursday October 14th.**

A one-hour test will be held, most likely on **Tuesday September 21st**, at 11am (room to be advised). All students should take this test.

If illness or other problems prevent you from completing any of the assignments you should contact your lecturer as soon as possible. A medical certificate will be required if you wish to apply for exemption from an assignment. If you are ill at the time of the test or exam you should contact Student Health and Counselling (telephone 373-7599 extension 87681) immediately to obtain information on how to apply for an aegrotat or compassionate pass.

Topics covered in the course
The list below shows the topics that will be covered in the course and the approximate order in which the material will be taught. Corresponding chapters in the textbook (3rd edition) and approximate allocation of lectures for each topic is indicated. Not all material in the indicated chapters will be covered in the course.

- **First order differential equations** [13 lectures] (Text, sections 1.1-1.9). Introduction to differential equations and modelling with differential equations. Introduction to the software package *Matlab*. Separable equations and linear equations. Slope fields. Numerical methods (introduction only). The phase line, equilibria, and bifurcations.

- **First order systems of differential equations** [16 lectures] (Text, sections 2.1-2.5, 3.1-3.5, 3.8, 5.1, 5.2). Phase plane and qualitative analysis. Linear systems, including classification of equilibria. Nonlinear systems, including classification of equilibria.

- **Higher order differential equations** [5 lectures] (Text, sections 3.6, 4.1-4.2).

Calculators
Unrestricted calculators may be used in the test and final exam.

English Language Assistance
The main assistance offered to students who need help with English language is ELSAC, the English Language Self-Access Centre, which has a website:

http://www.elsac.auckland.ac.nz/

This computer-laboratory based service is free and open seven days a week. Tutors are available to help. Alternatively, there are credit-bearing English language courses (ESOL 100/101/102).

The Department of Mathematics offers special tutorial support for Maori and Pasifika students (contact Garry Nathan, telephone 923-4931), and occasionally runs Mandarin or Cantonese-speaking tutorials (contact Jamie Sneddon, telephone 923-2121).

Collaborating & Cheating
You are encouraged to discuss problems with one another and to work together on assignments, but you must not copy another person's assignment. Assignment marks contribute to the final mark you receive in this course. We view cheating on assignment work as seriously as cheating in an examination.

Generally acceptable forms of collaboration include:
   • Getting help in understanding from staff and tutors.
   • Discussing assignments, tutorial examples and methods of solution with other students.

Generally unacceptable forms of collaboration ("cheating") include:
   • Copying all or part of another student's assignment, or allowing someone else to do all or part of your assignment for you.
   • Allowing another student to copy all or part of your assignment, or doing all or part of an assignment for somebody else. This is treated as seriously as copying another student's assignment.

If you are in any doubt about the permissible degree of collaboration, then please discuss it with a staff member.

Harassment & Complaints
Complaints about assignment or tutorial marks are best made to your lecturer who is in a position to do something immediately. More general complaints can be taken up by your class representative who will be elected or appointed in the first couple of lectures. You may also approach the Head of Department or the Departmental Manager for Mathematics (phone 923-8063).

Harassment on any grounds, such as racial, sexual, religious and academic is totally unacceptable. Complaints about harassment are best taken to the University Mediator (phone 923-7478) or to any member of the Resolve Network whose names are displayed on posters around the campus.