

THE UNIVERSITY OF SYDNEY  
Semester 2, 2009

---

Information Sheet for **MATH1013 Differential and Difference Equations**

---

**Web Site**

It is important that you check the Junior Mathematics web site regularly.

It may be found through WebCT, or by following links from the University of Sydney front page, or by going directly to

<http://www.maths.usyd.edu.au/u/UG/JM/>

Important announcements relating to Junior Mathematics are posted on the site, and there is a link to the MATH1013 page. Material available from the MATH1013 page may include information sheets, the Junior Mathematics Handbook, notes, exercise sheets and solutions, and previous examination papers.

**Lectures**

There are 2 different lecture streams. You should attend one stream (that is, two lectures per week), as shown on your personal timetable.

Times	Location	Lecturer	Consultation
8 am Thu & Fri	Carslaw 157	Prof L Poladian, Carslaw room 713	Mon & Thur, 1-2pm
11 am Thu & Fri	Wallace	Prof L Poladian, Carslaw room 713	Mon & Thur, 1-2pm

Lectures run for 13 weeks. The last lecture will therefore be on Friday 30 October.

**Tutorials**

Tutorials (one per week) start in week 2. You should attend the tutorial given on your personal timetable. Attendance at tutorials will be recorded. Your attendance will not be recorded unless you attend the tutorial in which you are enrolled.

The tutorial material for a given week will be available on the MATH1013 web page by the Friday of the previous week. You will need to print out the sheets required for the tutorial session from the web, and bring them with you to the tutorial.

### **Assessment**

Your final raw mark for this unit will be calculated as follows:

- 65%: Exam at end of semester 2.
- 30%: Quiz mark.
- 5%: Assignment mark.

Your final raw mark is then scaled to produce your final mark. Marks are scaled so that the distribution of grades is consistent with the quality of the class, and the difficulty of the unit, as required by the University.

### **Examination**

There is one examination of 1.5 hours' duration during the examination period at the end of semester 2. Further information about the exam will be made available at a later date.

### **Quizzes**

There are two quizzes, each worth 15% of your final raw mark. Quizzes are held during tutorials, in **week 6** (beginning 31 August) and **week 12** (beginning 19 October).

You should put those dates in your diary now! You must sit for the quiz during the tutorial in which you are enrolled. Your quiz mark will not be recorded if you sit for the quiz in a tutorial in which you are not enrolled (unless you have made an arrangement with the Student Office). If you miss a quiz, then you must go to the Student Office as soon as possible afterwards.

### **Assignments**

One assignment will be marked, and will be worth 5% of your final raw mark. The assignment will be due on **Thursday 17 September**. Please see page 26 of the Junior Mathematics Handbook for details relating to the submission of assignments.

### **Lecture notes**

*Differential and Difference Equations*. School of Mathematics and Statistics, University of Sydney, Sydney, NSW, Australia. Available from Kopystop.

*Note: The lecture notes have been re-written. Previous years' notes are not appropriate.*

### **Reference books**

See the Junior Mathematics and Statistics Handbook.

### **Any questions?**

Before you contact us with any enquiry, please check the FAQ page:

<http://www.maths.usyd.edu.au/u/UG/JM/FAQ.html>

### **Where to go for help**

For administrative matters, go to the **Mathematics Student Office, Carlaw room 520**.

For help with mathematics, see your lecturer, or your tutor. Lecturers guarantee to be available during their indicated office hour, but may well be available at other times as well.

If you are having difficulties with mathematics due to insufficient background, you should go to the Mathematics Learning Centre (Carlaw room 441).

## Objectives

The objectives of this course are to illustrate:

- how some experimental data, such as that obtained in the life sciences, can be explained by means of some types of differential and difference equations;
- how the setting up and solution of differential and difference equations can be used to solve problems found in the life sciences;
- how to find approximate solutions to certain equations in one variable which can be expected to arise in the context of studies in the life sciences.

## Outcomes

Students who successfully complete this course should be able to:

- set up, interpret and (if possible) solve ordinary differential equations of interest to students of the life sciences;
- set up, interpret and (if possible) solve difference equations frequently arising from mathematical modelling in the life sciences;
- approximate solutions of simple transcendental equations.

## Lecture-by-lecture Outline

1. intro to differential equations
2. general and particular solutions (differential equations)
3. equilibrium (steady-state) solutions for differential equations
4. stability of equilibria for differential equations (graphical method)
5. intro to difference equations
6. general and particular solutions (difference equations)
7. equilibrium (fixed-point) solutions for difference equations
8. stability of equilibria for difference equations
9. general solutions to simple linear first-order problems
10. ...continued
11. resource-limited growth (intro to logistic equation)
12. qualitative behaviour (equilibrium, stability)
13. exact solution of logistic differential equation
14. separation of variables
15. numerical solution of equations
16. fixed-point iteration (Gregory-Dary method)
17. behaviour of logistic map
18. applications of logistic map
- MID SEMESTER BREAK
19. second-order equations
20. the characteristic quadratic (real roots case only first)
21. pairs of first-order differential equations
22. pairs of first-order difference equations
23. trigonometric solutions
24. ...continued
25. review of the unit of study
26. review of past exam