THE UNIVERSITY OF SYDNEY
Semester 2, 2011

Information Sheet for **MATH1003 Integral Calculus and Modelling**

Web Sites
It is important that you regularly check both the Junior Mathematics web site

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

and the MATH1003 web site

`http://www.maths.usyd.edu.au/u/UG/JM/MATH1003`

Lectures
There are 3 different lecture streams. You should attend one stream (that is, two lectures per week), as shown on your personal timetable.

Times	Location	Lecturer
8am Thu & Fri	E Ave Aud	A/Prof C Macaskill, Carslaw room 627
11 am Thu & Fri	Wallace	Dr F Cîrstea, Carslaw room 719
11am Thu & Fri	E Ave Aud	Weeks 1-6: Dr C Cosgrove, Carslaw room 716 Weeks 7-13: Dr M Wechselberger, Carslaw room 628

Lectures run for 13 weeks. The last lecture will therefore be on Friday 28 October.

Consultation times
Lecturers are available for consultation as follows:

- Mondays 1-2pm in Carslaw 627
- Thursdays 1-2pm in Carslaw 716 (weeks 2-7) and in Carslaw 628 (weeks 8-13)
- Fridays 1-2pm in Carslaw 719

Duty tutors will also be available. Check the MATH1003 webpage.

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.

Tutorial sheets
The tutorial sheets for a given week will be available on the MATH1003 webpage. **You must take the current week's sheet to your tutorial.** The sheet must be printed from the web.
Solutions to tutorial exercises for week n will usually be posted on the web by the afternoon of the Friday of week n.

Course notes
NR O'Brian, CJ Durrant and DJ Galloway. *Integral Calculus and Modelling.* School of Mathematics and Statistics, University of Sydney, Sydney, NSW, Australia, 2011. Available from KOPYSTOP.

Reference book
James Stewart. *Calculus*. Brooks/Cole Publishing Company. ISBN 053459493. Available from the *CO-OP BOOKSHOP*.

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 7 (beginning 5 September) and **week 11** (beginning 10 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 Mathematics Student Office). If you miss a quiz, then you must go to the Mathematics 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 25 August**. Please see page 26 of the Junior Mathematics Handbook for details relating to the submission of assignments.

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, Carslaw room 520.**
For help with mathematics, see your lecturer, your tutor or a duty tutor. Lecturers guarantee to be available during their indicated office hour.
If you are having difficulties with mathematics due to insufficient background, you should go to the Mathematics Learning Centre (Carslaw room 441).

Objectives

The objectives of this unit are to illustrate:

- the relationship between integration and summation;
- that areas and volumes of revolution can be expressed as integrals;
- how the the Fundamental Theorem of Calculus can be used both to evaluate integrals and to define new functions, and determine their basic properties;
- standard techniques for finding anti-derivatives;
- the derivation of mathematical models of interest scientists and engineers which can be expressed in terms of differential equations;
- how a direction field for a differential equations can be used to graph approximate solutions;
- how the solution of first order separable and linear differential equation can be reduced to finding anti-derivatives;
- how to solve second order homogeneous linear differential equations with constant coefficients;
- the analysis of mathematical models of interest to scientists and engineers which are expressed in terms of differential equations.

Outcomes

Students who successfully complete this unit should be able to:

- approximate definite integrals by finite sums and vice versa;
- express areas, and volumes of revolution, as definite integrals;
- apply standard integration techniques to find anti-derivatives and definite integrals;
- determine properties of a function defined by an integral using the graph of its integrand;
- set up differential equations which arise from mathematical models of interest to scientists and engineers;
- see the relationship between a first order differential equation, its direction field, and its solution curves;
- solve separable and first order linear differential equations;
- solve second order homogeneous linear differential equations with constant coefficients;
- interpret properties of the solutions to differential equations which arise from mathematical models of interest to scientists and engineers.

Week-by-week outline

Week	Topic	Content
1	Riemann sums	Upper and lower Riemann sums Definition of definite integral Non-positive functions Difference between upper and lower sums
2	Definite integral: Theory & applications	Evaluation of integrals Estimation of integrals and sums Properties of the definite integral Fundamental Theorem Part II
3	Further applications	Areas and volumes by slicing Integration by substitution I Volumes by shells
4	Further applications Indefinite integral	Integration by parts Fundamental Theorem Part I Functions defined by integrals
5	Log & exp functions	Natural logarithm Natural exponential General forms
6	Introduction to models and DEs	Properties of models Direction fields Visualization of solution curves
7	First-order DEs I	Classification of differential equations Separable equations Integration by substitution II
8	First-order DEs II	Models including growth and decay Partial fractions
9	First-order DEs III	Linear equations Examples and models
10	Further examples and models	Radioactive dating Flow and mixing problems
11	Higher-order equations	Second-order homogeneous linear Boundary conditions Factorization, equal root case
12	Systems of equations	Reduction to second-order Predator-prey systems SHM, growing and damped oscillations