THE UNIVERSITY OF SYDNEY
Semester 2, 2017

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

Websites: It is important that you check both the Junior Mathematics website and the MATH1003 website regularly.

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

Both sites may be accessed through the Learning Management System (Blackboard):

`https://elearning.sydney.edu.au`.

Important announcements relating to Junior Mathematics are posted on the Junior Mathematics page. On the MATH1003 page you will find online resources and other useful links. Announcements regarding assessment tasks will be made on this page at various times throughout the semester.

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

Times	**Location**	**Lecturer**	**Office**
8am Thu & Fri	E Ave Aud	Eduardo Altmann	Carslaw 615
8am Thu & Fri	Carslaw 159	Ben Goldys/Matthew Chan	Carslaw 709/
11am Thu & Fri	E Ave Aud	Milena Radnović	Carslaw 624
11am Thu 11am Fri	Wallace LT200 ABS B2010	Sharon Stephen	Carslaw 525
11am Thu 11am Fri	ABS LT1110 Chemistry LT1	Boris Lishak/Michael Watson	Carslaw 534

Lectures run for 13 weeks. The first lecture will be on Thursday 3rd August. The last lecture will be on Friday 3rd November.

Consultation times: Consultation times will be posted on 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 and exercise sheets: The question sheets for a given week will be available on the MATH1003 webpage. 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: N. R. O'Brian, C. J. Durrant and D. J. Galloway. *Integral Calculus and Modelling.* School of Mathematics and Statistics, University of Sydney, Sydney, NSW, Australia, 2017. Available from Kopystop.

Reference book: James Stewart. *Calculus.* Cengage Learning. 7th Edition, International Edition, 2012, ISBN 978-0-538-49884-5 or 8th Edition, Metric Version, 2015, ISBN 978-1-305-26672-8. Available from the Co-op Bookshop.

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

65%: Exam at end of Semester 2.
15%: Quiz 1 mark (using the better mark principle).
15%: Quiz 2 mark (using the better mark principle).
2.5%: Assignment 1 mark.
2.5%: Assignment 2 mark.

The *better mark principle* means that for each quiz, the quiz counts if and only if it is better than or equal to your exam mark. If your quiz mark is less than your exam mark, the exam mark will be used for that portion of your assessment instead. For example, if your quiz 1 mark is better than your exam mark while your quiz 2 mark is worse than your exam mark, then the exam will count for 80%, quiz 1 will count for 15%, and the assignments will count for 5% of your overall mark. The assignment marks count for 5% regardless of whether they are better than your exam mark or not.

Final grades are returned within one of the following bands:

> **High Distinction (HD), 85–100:** representing complete or close to complete mastery of the material; **Distinction (D), 75–84:** representing excellence, but substantially less than complete mastery; **Credit (CR), 65–74:** representing a creditable performance that goes beyond routine knowledge and understanding, but less than excellence; **Pass (P), 50–64:** representing at least routine knowledge and understanding over a spectrum of topics and important ideas and concepts in the course.

A student with a passing or higher grade should be well prepared to undertake further studies in mathematics which are dependent on this unit of study.

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 on the website.

Quizzes: Quizzes will be held during tutorials. You must sit for the quiz during the tutorial in which you are enrolled, unless you have a Permission Slip from the Student Services Office, issued only for verifiable reasons. Otherwise, your quiz mark may not be recorded. Quizzes will only be returned in the tutorial you sat the quiz and must be collected by week 13.

Assignments: There are two assignments, which must be submitted electronically, **as PDF files only**, in Turnitin (an internet-based plagiarism-prevention service), via the Learning Management System (Blackboard) website by the deadline. Note that your assignment will not be marked if it is illegible or if it is submitted sideways or upside down. It is your responsibility to check that your assignment has been submitted correctly (check that you can view each page).

Assessment and feedback schedule:

Task	Available	Deadline/date	Latest extension*	Feedback
Assignment 1	Mon 7 Aug	5pm Thu 17 Aug	5pm Thu 24 Aug	9am Mon 28 Aug
Quiz 1		11–13 Sep (Week 7)		18–20 Sep (Week 8)
Assignment 2	Mon 18 Sep	5pm Thu 5 Oct	5pm Thu 12 Oct	9am Mon 16 Oct
Quiz 2		16–18 Oct (Week 11)		23–25 Oct (Week 12)

* Extensions for assignments are only possible for students registered with Disability Services or for approved Special Consideration or Special Arrangements applications.

Special consideration and special arrangements: While studying at the University of Sydney, you may need to apply for special consideration or special arrangements as follows:

> Special consideration may be granted to students where well-attested illness, injury, or misadventure occurs to them (or someone they have carer's responsibility for) during the semester or the exam period. Special arrangements may be granted for essential community commitments. Further information on eligibility, document requirements, and how to apply is available at `http://sydney.edu.au/students/special-consideration-and-arrangements.html`. Applications must be made using the University's formal online application process.
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> Final examinations will be held in the formal examination period. Students affected by illness, injury or misadventure may lodge a request for Special Consideration to sit a replacement examination in the formal Replacement Examination period.
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> If you are registered with Disability Services and would like to have adjustments applied to the replacement examination, you are required to amend your Academic Plan with Disability Services specifically for this replacement examination. This needs to be done as soon as you are notified of award of the replacement opportunity. If you have not done so, you will be allowed to sit the replacement, but under unadjusted conditions.

You should *not* submit an application of either type

- if you are absent from a tutorial and there is no assessment associated with the missed tutorial, or

- if you miss a quiz, since the better mark principle applies.

The assessment category for the assignments is "Submitted Work".

If you are granted a "mark adjustment" for a quiz or an assignment, any marks obtained will not count and the weighting will be added to the examination weighting.

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 *Student Services Office, Carslaw 520*. For help with mathematics, see your lecturer, your tutor, a duty tutor, or use the Ed discussion forum (`https://edstem.com.au`). Lecturers guarantee to be available during their indicated office hours, but may be available at other times as well. If you are having difficulties with mathematics due to insufficient background, you may seek help from the *Mathematics Learning Centre, Carslaw 177*. You may also email questions about the subject to `MATH1003@sydney.edu.au`. Ensure that any emails that you send to this address contain your name and SID, because anonymous emails will be ignored.

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.

Proposed week-by-week outline:

Week	Topic	Content	Course Notes
1	Riemann sums	Upper and lower Riemann sums Definition of definite integral Non-positive functions	Chapter 1 Chapter 2
2	Definite integral: Theory & applications	Evaluation of integrals Estimation of integrals and sums Properties of the definite integral Fundamental Theorem Part II	Chapter 3
3	Further applications	Areas and volumes by slicing Integration by substitution I Volumes	Chapter 4 Chapter 6 (except last section) – Trigonomic Substitutions
4	Further applications Indefinite integral	Integration by parts Fundamental Theorem Part I Functions defined by integrals	Chapter 7 – Integration by parts and Reduction Formulas Chapter 5 (first 4 pages)
5	Log & exp functions	Natural logarithm Natural exponential General forms	Chapter 5
6	Introduction to models and DEs	Properties of models Direction fields Visualization of solution curves	Chapter 8
7	First-order DEs I	Classification of differential equations Separable equations Integration by substitution II	Chapter 9 Chapter 6 – last section
8	First-order DEs II	Models including growth and decay Partial fractions	Chapter 7 – Partial Fractions (omit Wallis Product and Computer Algebra Systems) Chapter 10
9	First-order DEs III	Linear equations Examples and models	Chapter 11
10	Further examples and models	Radioactive dating Flow and mixing problems	Chapter 11
11	Higher-order equations	Second-order homogeneous linear Boundary conditions Factorization, equal root case	Chapter 12
12	Systems of equations	Reduction to second-order Predator-prey systems	Chapter 13
13	Review		