
Information Sheet for **MATH1013 Mathematical Modelling**

Websites: It is important that you check both the Junior Mathematics website and the MATH1013 website regularly.

Junior Mathematics webpage: <http://www.maths.usyd.edu.au/u/UG/JM/>
MATH1013 webpage: <http://www.maths.usyd.edu.au/u/UG/JM/MATH1013>

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 MATH1013 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 two 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	Wallace LT200	Leon Poladian/Peter Kim	Carslaw 713/621
11am Thu 11am Fri	Merewether LT1 New Law LT101	Leon Poladian/Collin Zheng	Carslaw 713/495

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 MATH1013 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 MATH1013 webpage. Solutions to tutorial exercises for week n will usually be posted on the web by the afternoon of the Friday of week n .

Lecture notes: L. Poladian. *Mathematical Modelling*. School of Mathematics and Statistics, University of Sydney, Sydney, NSW, Australia, 2011. Available from Kopystop.

Reference books: See the Junior Mathematics and Statistics Handbook.

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

- 55%: Exam at end of Semester 2.
- 15%: Quiz 1 mark (using the better mark principle).
- 15%: Quiz 2 mark (using the better mark principle).
- 10%: Online homework mark.
- 2.5%: Assignment 1 mark.
- 2.5%: Assignment 2 mark (research review).

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 70%, quiz 1 will count for 15%, the homework will count for 10%, and the assignments will count for 5% of your overall mark. The homework and assignment marks are always counted directly 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.

Online homework: There will be ten online homework quizzes each worth 1% and they will count in total for 10% of your final mark. Online homework is provided to support your learning to and give you the opportunity to practise the basic skills introduced in this unit. Each online item may be attempted **as many times as desired**, and only your best attempt is counted. You may do the homework at whatever time and pace suits you, but all items must be completed before the end of the study vacation (5pm on Friday 10 November). More information about online homework will be given in lectures and on the MATH1013 webpage.

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 14 Aug	5pm Thu 24 Aug	5pm Thu 31 Aug	9am Mon 4 Sep
Quiz 1		4–6 Sep (Week 6)		11–13 Sep (Week 7)
Assignment 2	Mon 2 Oct	5pm Thu 12 Oct	5pm Thu 19 Oct	9am Mon 23 Oct
Quiz 2		23–25 Oct (Week 12)		30 Oct–1 Nov (Week 13)
Homework		5pm Fri 10 Nov		

* 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.

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.

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 MATH1013@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:

- classify, interpret and construct simple mathematical models;
- compare and discuss the results of applying different models to the same data or situation;
- understand the limitations of models and mathematical methods;
- recognise the same information or model when presented in different forms, and convert or transform between equivalent forms;
- extract qualitative information from a model, including the use of graphical methods;
- apply simple techniques in unfamiliar situations, including generalising from simple to complex systems;
- use numerical exploration to understand models, including estimation and approximation.

Outcomes: Students who successfully complete this unit should be able to:

- write down general and particular solutions to simple differential equations and recurrence relations describing models of growth and decay;
- determine the order of a differential equation or recurrence relation;
- find equilibrium solutions and analyse their stability using both graphical methods and slope conditions;
- recognise and solve separable first-order differential equations;
- use partial fractions and separation of variables to solve certain nonlinear differential equations, including the logistic equation;
- use a variety of graphical and numerical techniques to locate and count solutions to equations;

- solve equations numerically by fixed-point iteration, including checking if an iteration method is stable;
- explore sequences numerically, and classify their long-term behaviour;
- determine the general solution to linear second-order equations or simultaneous pairs of first order equations with constant coefficients.

Lecture-by-lecture outline:

1. assumed knowledge for differential equations
 2. intro to differential equations (general and particular solutions)
 3. equilibrium (steady-state) solutions for differential equations
 4. stability of equilibria for differential equations (graphical method)
 5. separation of variables
 6. simple linear models
 7. partial fractions
 8. the logistic function
 9. applications of logistic models
 10. more applications of logistic models
 11. assumed knowledge for arithmetic and geometric sequences
 12. intro to recurrence relations (general and particular solutions)
 13. equilibrium (fixed-point) solutions
 14. stability of fixed points
 15. numerical solution of equations
 16. fixed-point iteration (Gregory–Dary method)
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17. behaviour of logistic map
 18. applications of logistic map
 19. second-order equations
 20. the characteristic quadratic (positive discriminants only)
 21. pairs of first-order differential equations
 22. pairs of first-order recurrence equations
 23. the characteristic equation (negative discriminants)
 24. oscillating (trigonometric) solutions
 25. review of the unit of study
 26. review of past exam