



UNSW Course Outline

MATH3041 Mathematical Modelling for Real World Systems - 2024

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General Course Information

Course Code : MATH3041

Year : 2024

Term : Term 2

Teaching Period : T2

Is a multi-term course? : No

Faculty : Faculty of Science

Academic Unit : School of Mathematics & Statistics

Delivery Mode : In Person

Delivery Format : Standard

Delivery Location : Kensington

Campus : Sydney

Study Level : Undergraduate

Units of Credit : 6

Useful Links

[Handbook Class Timetable](#)

Course Details & Outcomes

Course Description

Should I run or walk in the rain? Why did Nelson win the Battle of Trafalgar? How will Earth's

climate evolve in the future?

Mathematical Modelling for Real World Systems is both for Mathematics and Statistics majors interested in how mathematics is applied and students from other fields looking for an overview of mathematical tools with practical applications.

Motivated by real world problems, the course will survey mathematical techniques for: achieving the best possible outcomes, predicting future events and dealing with uncertainties. The course will provide introductions to data fitting, discrete time systems, simulation modelling, dimensional analysis and numerical simulation and involve substantial development of differential equations and systems of differential equations.

Real world applications include:

- Biology (e.g. cell growth and population dynamics)
- Health (e.g. drug delivery and infectious diseases);
- Finance;
- Environment and Climate Change.

As part of the course requirements, students will be expected to work in groups on mathematical modelling projects and prepare a group report, both written and oral, describing the project. The course aims to equip students with the modelling skills and presentation skills for dealing with real world problems. The course involves weekly lectures and tutorials in the earlier parts of the term, transitioning to group work and seminar sessions towards the end of term.

Course Aims

The fundamental aim of this course is to help students to acquire the skills that major employers of science and mathematics graduates have expressed a need for.

Unlike most other courses in Mathematics and Statistics the focus is on practical applications of mathematics. Through the course material, independent and group work, students will develop skills in formulating, modelling and solving practical problems; flexibility in applying mathematics and problem solving across different applications and computational skills. Through group work, students will also develop their written and spoken communication and teamwork skills.

Relationship to Other Courses

Prerequisite: 12 units of credit in Level 2 Maths courses.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Apply the concepts, principles and theory used in mathematical modelling to solve real world problems.
CLO2 : Communicate mathematical concepts, logic and results in written and verbal formats.
CLO3 : Collaborate with peers on broad, multi-faceted research projects to solve real world problems using mathematics.
CLO4 : Solve mathematical problems using a range of tools including dimensional analysis, difference equations, statistics and differential equations.
CLO5 : Critically assess and provide feedback on mathematical models and their application to the real world.

Course Learning Outcomes	Assessment Item
CLO1 : Apply the concepts, principles and theory used in mathematical modelling to solve real world problems.	<ul style="list-style-type: none">• Individual Assignment• Class Test• Group Project
CLO2 : Communicate mathematical concepts, logic and results in written and verbal formats.	<ul style="list-style-type: none">• Peer Feedback• Individual Assignment• Class Test• Group Project
CLO3 : Collaborate with peers on broad, multi-faceted research projects to solve real world problems using mathematics.	<ul style="list-style-type: none">• Peer Feedback• Group Project
CLO4 : Solve mathematical problems using a range of tools including dimensional analysis, difference equations, statistics and differential equations.	<ul style="list-style-type: none">• Individual Assignment• Class Test• Group Project
CLO5 : Critically assess and provide feedback on mathematical models and their application to the real world.	<ul style="list-style-type: none">• Peer Feedback• Group Project

Learning and Teaching Technologies

Moodle - Learning Management System | Microsoft Teams | Echo 360

Learning and Teaching in this course

The lecture material for MATH3041 will be delivered through a combination of live lectures, interactive seminar session and pre-recorded videos.

Live sessions will be recorded and made available. Students are encouraged to attend all

sessions in person. Some sessions such as the class test, group meetings with lecturers and student presentations will be held during these times and will be mandatory.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Individual Assignment Assessment Format: Individual	20%	Start Date: Not Applicable Due Date: Week 5
Peer Feedback Assessment Format: Individual	5%	Due Date: Friday of Week 4
Class Test Assessment Format: Individual	45%	Start Date: Not Applicable Due Date: Monday of Week 8
Group Project Assessment Format: Group	30%	Due Date: Friday of Week 10

Assessment Details

Individual Assignment

Assessment Overview

Your first assessment activity for this course will involve you carrying out independent research on the application of mathematical models to a real-world problem.

Our aim with this activity is for you to: familiarize yourself with some of the history of mathematical modelling in a specific context, to help you develop information technology skills through independent research of a topic, and to help you gain communication skills through preparing written reports using mathematical typesetting. Guidelines for the style and length of the report will be provided when the assessment activity is issued.

This activity will start in week 1 and conclude in week 5. You will submit a draft in week 3 to receive feedback from your peers in week 4, with final submission in week 5. This will then allow you to improve your assignment before final assessment and feedback by the course instructors.

Course Learning Outcomes

- CL01 : Apply the concepts, principles and theory used in mathematical modelling to solve real world problems.
- CL02 : Communicate mathematical concepts, logic and results in written and verbal formats.
- CL04 : Solve mathematical problems using a range of tools including dimensional analysis, difference equations, statistics and differential equations.

Detailed Assessment Description

Your first assessment activity for this course will involve you carrying out independent research on the application of mathematical models to a real-world problem.

Our aim with this activity is for you to: familiarize yourself with some of the history of mathematical modelling in a specific context, to help you develop information technology skills through independent research of a topic, and to help you gain communication skills through preparing written reports using mathematical typesetting. Guidelines for the style and length of the report will be provided when the assessment activity is issued.

This activity will start in week 1 and conclude in week 5. You will submit a draft in week 3 to receive feedback from your peers in week 4, with final submission in week 5. This will then allow you to improve your assignment before final assessment and feedback by the course instructors.

Assessment Length

1500 words

Assessment information

UNSW's standard late submission penalty of 5% per day will be applied for the final submission, capped at five days (120 hours) from the assessment deadline, after which a student cannot submit the assessment.

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Peer Feedback

Assessment Overview

An important outcome of this course will be your development of peer review and constructive criticism skills. You will be assessed on your ability to identify potential improvements to your peers' work and provide constructive written feedback.

Peer review will typically occur in weeks 3-4 and week 9 for both Individual Assignment drafts and Group Project overview presentations.

Feedback regarding the quality of your peer reviews will be in the tutorials following submission.

Course Learning Outcomes

- CL02 : Communicate mathematical concepts, logic and results in written and verbal formats.
- CL03 : Collaborate with peers on broad, multi-faceted research projects to solve real world problems using mathematics.
- CL05 : Critically assess and provide feedback on mathematical models and their application to the real world.

Detailed Assessment Description

An important outcome of this course will be your development of peer review and constructive criticism skills. You will be assessed on your ability to identify potential improvements to your peers' work and provide constructive written feedback.

The peer review task will occur in week 4 for the Individual Assignment drafts.

Feedback regarding the quality of your peer reviews will be in the tutorials following submission.

Assessment Length

100 words per review (up to 4 reviews)

Assessment information

No late submissions will be accepted past the deadline.

Assignment submission Turnitin type

This is not a Turnitin assignment

Class Test

Assessment Overview

The class test is designed to summarise your learning and problem-solving skills on the core mathematical content delivered across weeks 1-7 of the term, including material from lectures and tutorials.

The test is typically 2hrs and consists of both mathematical and conceptual problems requiring worked explanations and accurate solutions.

The test will occur approximately at the end of week 7 and before you dedicate your time to the Group Project. Feedback will be given including worked solutions.

Supplementary test opportunity: If you do not achieve 50% in the class test, you will be given the opportunity to sit a supplementary test with your grade capped at 50%.

Hurdle requirement: you must achieve 50% in either the class test or the supplementary class test to receive a passing grade in the course.

Course Learning Outcomes

- CL01 : Apply the concepts, principles and theory used in mathematical modelling to solve real world problems.
- CL02 : Communicate mathematical concepts, logic and results in written and verbal formats.
- CL04 : Solve mathematical problems using a range of tools including dimensional analysis, difference equations, statistics and differential equations.

Detailed Assessment Description

The class test is designed to summarise your learning and problem-solving skills on the core mathematical content delivered across weeks 1-7 of the term, including material from lectures and tutorials.

The test is typically 2hrs and consists of both mathematical and conceptual problems requiring worked explanations and accurate solutions.

The test will occur at the beginning of Week 8 and before you dedicate your time to the Group Project. Feedback will be given including worked solutions.

Supplementary test opportunity: If you do not achieve 50% in the class test, you will be given the opportunity to sit a supplementary test with your grade capped at 50%.

Hurdle requirement: you must achieve 50% in either the class test or the supplementary class test to receive a passing grade in the course.

Assessment Length

2 hours

Assignment submission Turnitin type

This is not a Turnitin assignment

Hurdle rules

A hurdle requirement or hurdle rule is a course requirement that must be fulfilled in order to pass the course.

Group Project

Assessment Overview

A major part of the assessment for this course will be based on a group project. You will begin

preliminary aspects of the group work projects midway through the term but most work will be concentrated in weeks 8-10.

Each project will deal mathematically with a real world problem. Your team will consist of four to six individuals. Each member of your team will be expected to participate in all aspects of the project including: background research; setting up the model; mathematical analysis of the model; writing computer code; and preparation of final reports and presentations.

Your group will produce a Group Presentation (5%) and a written Group Report 25%).

Your peers and instructors will provide feedback on your project after your presentation allowing you to use this information to improve your report.

While your entire Group Project grade will typically be the same for all members of your group, your grade may be adjusted based on evidence of your own contribution to the project gathered by the lecturer. This evidence may come from participation in the group discussion forum, involvement in group meetings with the course teaching staff and in group presentations and peer assessment. In circumstances where the course convenor deems that a student has not contributed substantively to the project, the student may have their mark for this assessment reduced.

Course Learning Outcomes

- CL01 : Apply the concepts, principles and theory used in mathematical modelling to solve real world problems.
- CL02 : Communicate mathematical concepts, logic and results in written and verbal formats.
- CL03 : Collaborate with peers on broad, multi-faceted research projects to solve real world problems using mathematics.
- CL04 : Solve mathematical problems using a range of tools including dimensional analysis, difference equations, statistics and differential equations.
- CL05 : Critically assess and provide feedback on mathematical models and their application to the real world.

Detailed Assessment Description

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Assessment information

No late submissions will be accepted past the deadline.

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

General Assessment Information

Grading Basis

Standard

Requirements to pass course

To pass the course student must demonstrate a mastery of the course content by achieving a pass grade for the class test. Students who do not pass the test during the term will be given a second opportunity in week 11 to achieve a pass grade.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 27 May - 2 June	Lecture	Introduction to Modelling, Dimensional Analysis
Week 2 : 3 June - 9 June	Lecture	Fitting Real World Data
Week 3 : 10 June - 16 June	Lecture	Discrete Time Systems, Simulation Modelling
Week 4 : 17 June - 23 June	Lecture	Modelling with Differential Equations
Week 5 : 24 June - 30 June	Lecture	Interacting Populations
Week 7 : 8 July - 14 July	Lecture	Epidemics, Revision
Week 8 : 15 July - 21 July	Assessment	Class test and start of groupwork.
Week 9 : 22 July - 28 July	Group Work	Group Projects
Week 10 : 29 July - 4 August	Group Work	Group Projects

Attendance Requirements

In weeks 1-6 and 7, students are strongly encouraged to attend all classes and review lecture recordings.

In weeks 8, 9 and 10 there will be activities relating to group projects some of which will require students to represent themselves. These will include meetings with the group and lecturer and group presentations.

General Schedule Information

The scheudle below is a guide only and students should follow moodle and moodle annoucnements careful for the exact progression of the course.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Lecturer	Jan Zika		H13 Anita Lawrence building 4105	93855827	Monday, Wednesday, Thursday	No	Yes

Other Useful Information

Academic Information

Upon your enrolment at UNSW, you share responsibility with us for maintaining a safe, harmonious and tolerant University environment.

You are required to:

- Comply with the University's conditions of enrolment.
- Act responsibly, ethically, safely and with integrity.
- Observe standards of equity and respect in dealing with every member of the UNSW community.
- Engage in lawful behaviour.
- Use and care for University resources in a responsible and appropriate manner.
- Maintain the University's reputation and good standing.

For more information, visit the [UNSW Student Code of Conduct Website](https://student.unsw.edu.au/conduct).

Academic Honesty and Plagiarism

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.

Further information about referencing styles can be located at <https://student.unsw.edu.au/referencing>

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect, responsibility and courage. At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.

Further information about academic integrity, plagiarism and the use of AI in assessments can be located at:

- The [Current Students site](https://student.unsw.edu.au/current-students),
- The [ELISE training site](https://student.unsw.edu.au/elise), and
- The [Use of AI for assessments](https://student.unsw.edu.au/use-of-ai) site.

The Student Conduct and Integrity Unit provides further resources to assist you to understand your conduct obligations as a student: <https://student.unsw.edu.au/conduct>

Submission of Assessment Tasks

Penalty for Late Submissions

UNSW has a standard late submission penalty of:

- 5% per day,

- for all assessments where a penalty applies,
- capped at five days (120 hours) from the assessment deadline, after which a student cannot submit an assessment, and
- no permitted variation.

Any variations to the above will be explicitly stated in the Course Outline for a given course or assessment task.

Students are expected to manage their time to meet deadlines and to request extensions as early as possible before the deadline.

Special Consideration

If circumstances prevent you from attending/completing an assessment task, you must officially apply for special consideration, usually within 3 days of the sitting date/due date. You can apply by logging onto myUNSW and following the link in the My Student Profile Tab. Medical documentation or other documentation explaining your absence must be submitted with your application. Once your application has been assessed, you will be contacted via your student email address to be advised of the official outcome and any actions that need to be taken from there. For more information about special consideration, please visit: <https://student.unsw.edu.au/special-consideration>

Important note: UNSW has a “fit to sit/submit” rule, which means that if you sit an exam or submit a piece of assessment, you are declaring yourself fit to do so and cannot later apply for Special Consideration. This is to ensure that if you feel unwell or are faced with significant circumstances beyond your control that affect your ability to study, you do not sit an examination or submit an assessment that does not reflect your best performance. Instead, you should apply for Special Consideration as soon as you realise you are not well enough or are otherwise unable to sit or submit an assessment.

Faculty-specific Information

Additional support for students

- [The Current Students Gateway](#)
- [Student Support](#)
- [Academic Skills and Support](#)
- [Student Wellbeing, Health and Safety](#)
- [Equitable Learning Services](#)
- [UNSW IT Service Centre](#)
- Science EDI Student [Initiatives](#), [Offerings](#) and [Guidelines](#)

School-specific Information

School of Mathematics and Statistics and UNSW Policies

The School of Mathematics and Statistics has adopted a number of policies relating to enrolment, attendance, assessment, plagiarism, cheating, special consideration etc. These are in addition to the Policies of The University of New South Wales. Individual courses may also adopt other policies in addition to or replacing some of the School ones. These will be clearly notified in the Course Initial Handout and on the Course Home Pages on the Maths Stats web site. Students in courses run by the School of Mathematics and Statistics should be aware of the School and Course policies by reading the appropriate pages on the web site starting at: [The School of Mathematics and Statistics assessment policies](#)

The School of Mathematics and Statistics will assume that all its students have read and understood the School policies on the above pages and any individual course policies on the Course Initial Handout and Course Home Page. Lack of knowledge about a policy will not be an excuse for failing to follow the procedure in it.

Special Consideration - Short Extension Policy

The School of Mathematics and Statistics has carefully reviewed its range of assignments and projects to determine their suitability for automatic short extensions as set out by the UNSW Short Extension Policy. Upon comprehensive examination of our course offerings that incorporate these types of assessments, we have concluded that our current deadline structures already accommodate the possibility of unexpected circumstances that may lead students to require additional days for submission. Consequently, the School of Mathematics and Statistics has decided to universally opt out of the Short Extension provision for all its courses, having pre-emptively integrated flexibility into our assessment deadlines. The decision is subject to revision in response to the introduction of new course offerings. Students may still apply for Special Consideration via the usual procedures.

Computing Lab

The main computing laboratory is room G012 of the Anita B. Lawrence Centre (formerly Red Centre). You can get to this lab by entering the building through the main entrance to the School of Mathematics (on the Mezzanine Level) and then going down the stairs to the Ground Level. A second smaller lab is Room M020, located on the mezzanine level through the glass door (and

along the corridor) opposite the School's entrance.

For more information, including opening hours, see the [computing facilities webpage](#). Remember that there will always be unscheduled periods when the computers are not working because of equipment problems and that this is not a valid excuse for not completing assessments on time.

School Contact Information

Please visit the [School of Mathematics and Statistics website](#) for a range of information.

For information on Courses, please go to "Student life & resources" and either Undergraduate and/or Postgraduate and respective "Undergraduate courses" and "Postgraduate courses" for information on all course offerings.

All school policies, forms and help for students can be located by going to the "Student Services" within "Student life & resources" page. We also post notices in "Student noticeboard" for your information. Please familiarise yourself with the information found in these locations. If you cannot find the answer to your queries on the web you are welcome to contact the Student Services Office directly.

Undergraduate

E: ug.mathsstats@unsw.edu.au

P: 9385 7011 or 9385 7053

Postgraduate

E: pg.mathsstats@unsw.edu.au

P: 9385 7053

Should we need to contact you, we will use your official UNSW email address of in the first instance. **It is your responsibility to regularly check your university email account. Please use your UNSW student email and state your student number in all emails to us.**