



# MATH1025

## Mathematical Modelling IB (Advanced)

Session 2, Special circumstance 2020

*Department of Mathematics and Statistics*

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#### Disclaimer

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.

#### Notice

As part of [Phase 3 of our return to campus plan](#), most units will now run tutorials, seminars and other small group learning activities on campus for the second half-year, while keeping an online version available for those students unable to return or those who choose to continue their studies online.

To check the availability of face-to-face and online activities for your unit, please go to [timetable viewer](#). To check detailed information on unit assessments visit your unit's iLearn space or consult your unit convenor.

## General Information

Unit convenor and teaching staff

Unit Convenor/Lecturer

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Contact via Email

please refer to iLearn

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Credit points

10

Prerequisites

MATH1010(D) or MATH1015(D) or MATH135(HD) or MATH132

Corequisites

Co-badged status

Unit description

The foundations of linear algebra and calculus introduced in MATH1015 are further explored and extended. Topics covered in algebra include: inverse matrices, determinants, vector spaces & subspaces, eigenvalues and eigenvectors and linear transformations. In calculus the topics include: the further development of the concepts of limits, continuity and the derivative, numerical integration, polynomials, sequences & series and differential equations. In addition, complex numbers and the calculus of two or more variables are introduced. Students utilise mathematical software throughout the course to support and enhance problem solving for a variety of theoretical and practical problems.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

## Learning Outcomes

On successful completion of this unit, you will be able to:

**ULO1:** Apply matrix inversion and decomposition methods to determine solutions to systems of linear equations.

**ULO2:** Analyse vectors and linear maps in spaces of arbitrary dimension, developing concepts such as vector spaces and eigenspaces.

**ULO3:** Utilise complex numbers and techniques of differentiation and integration to determine and compare properties of single variable and multivariable functions.

**ULO4:** Analyse the convergence of a wide range of infinite series, including Taylor series.

**ULO5:** Evaluate elementary numerical techniques for root finding, function approximation and integration, in order to assess the convergence criteria or the error estimate of the method.

## General Assessment Information

**HURDLES:** No hurdle requirements

**ASSIGNMENT SUBMISSION:** Assignment submission will be online through the iLearn page.

Submit assignments online via the appropriate assignment link on the iLearn page. A personalised cover sheet is not required with online submissions. Read the submission statement carefully before accepting it as there are substantial penalties for making a false declaration.

- Assignment submission is via iLearn. You should upload this as a single scanned PDF file.
- Please note the quick guide on how to upload your assignments provided on the iLearn page.
- Please make sure that each page in your uploaded assignment corresponds to only one A4 page (do not upload an A3 page worth of content as an A4 page in landscape). If you are using an app like Clear Scanner, please make sure that the photos you are using are clear and shadow-free.
- It is your responsibility to make sure your assignment submission is legible.
- If there are technical obstructions to your submitting online, please email us to let us know.

You may submit as often as required prior to the due date/time. Please note that each submission will completely replace any previous submissions. It is in your interests to make frequent submissions of your partially completed work as insurance against technical or other

problems near the submission deadline.

**LATE SUBMISSION OF WORK:** All assessment tasks must be submitted by the official due date and time. In the case of a late submission for a non-timed assessment (e.g. an assignment), if special consideration has NOT been granted, 20% of the earned mark will be deducted for each 24-hour period (or part thereof) that the submission is late for the first 2 days (including weekends and/or public holidays). For example, if an assignment is submitted 25 hours late, its mark will attract a penalty equal to 40% of the earned mark. After 2 days (including weekends and public holidays) a mark of 0% will be awarded. Timed assessment tasks (e.g. tests, examinations) do not fall under these rules.

**FINAL EXAM POLICY:** It is Macquarie University policy not to set early examinations for individuals or groups of students. All students are expected to ensure that they are available until the end of the teaching semester, that is, the final day of the official examination period. The only excuse for not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these special circumstances, you may apply for special consideration via [ask.mq.edu.au](http://ask.mq.edu.au).

If you receive special consideration for the final exam, a supplementary exam will be scheduled in the interval between the regular exam period and the start of the next session. By making a special consideration application for the final exam you are declaring yourself available for a resit during this supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application.

You can check the supplementary exam information page on FSE101 in iLearn ([bit.ly/FSESup](http://bit.ly/FSESup)) for dates, and approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#">Major Test 1</a>	20%	No	Week 5
<a href="#">Major Test 2</a>	20%	No	Week 11
<a href="#">Assignment</a>	10%	No	Week 12
<a href="#">Final Examination</a>	50%	No	Exam period

### Major Test 1

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 7 hours

Due: **Week 5**

Weighting: **20%**

This will be an online test held during the semester. It will test the ability of students to analyse and solve mathematical problems using concepts and techniques in linear algebra and calculus.

On successful completion you will be able to:

- Apply matrix inversion and decomposition methods to determine solutions to systems of linear equations.
- Analyse vectors and linear maps in spaces of arbitrary dimension, developing concepts such as vector spaces and eigenspaces.
- Utilise complex numbers and techniques of differentiation and integration to determine and compare properties of single variable and multivariable functions.
- Analyse the convergence of a wide range of infinite series, including Taylor series.
- Evaluate elementary numerical techniques for root finding, function approximation and integration, in order to assess the convergence criteria or the error estimate of the method.

## Major Test 2

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 7 hours

Due: **Week 11**

Weighting: **20%**

This will be an online test held during the semester. It will test the ability of students to analyse and solve mathematical problems using concepts and techniques in linear algebra and calculus.

On successful completion you will be able to:

- Apply matrix inversion and decomposition methods to determine solutions to systems of linear equations.
- Analyse vectors and linear maps in spaces of arbitrary dimension, developing concepts such as vector spaces and eigenspaces.
- Utilise complex numbers and techniques of differentiation and integration to determine and compare properties of single variable and multivariable functions.
- Analyse the convergence of a wide range of infinite series, including Taylor series.
- Evaluate elementary numerical techniques for root finding, function approximation and integration, in order to assess the convergence criteria or the error estimate of the method.

## Assignment

Assessment Type <sup>1</sup>: Problem set

Indicative Time on Task <sup>2</sup>: 7 hours

Due: **Week 12**

Weighting: **10%**

This assignment will test the ability of students to solve theoretical mathematical problems using concepts and techniques from linear algebra and calculus, and prove mathematical statements.

On successful completion you will be able to:

- Apply matrix inversion and decomposition methods to determine solutions to systems of linear equations.
- Analyse vectors and linear maps in spaces of arbitrary dimension, developing concepts such as vector spaces and eigenspaces.
- Utilise complex numbers and techniques of differentiation and integration to determine and compare properties of single variable and multivariable functions.
- Analyse the convergence of a wide range of infinite series, including Taylor series.
- Evaluate elementary numerical techniques for root finding, function approximation and integration, in order to assess the convergence criteria or the error estimate of the method.

## Final Examination

Assessment Type <sup>1</sup>: Examination

Indicative Time on Task <sup>2</sup>: 15 hours

Due: **Exam period**

Weighting: **50%**

This will be held during the final exam period. It will test the ability of students to synthesise the concepts taught in the course in order to analyse and solve mathematical problems with various applications.

On successful completion you will be able to:

- Apply matrix inversion and decomposition methods to determine solutions to systems of linear equations.

- Analyse vectors and linear maps in spaces of arbitrary dimension, developing concepts such as vector spaces and eigenspaces.
- Utilise complex numbers and techniques of differentiation and integration to determine and compare properties of single variable and multivariable functions.
- Analyse the convergence of a wide range of infinite series, including Taylor series.
- Evaluate elementary numerical techniques for root finding, function approximation and integration, in order to assess the convergence criteria or the error estimate of the method.

<sup>1</sup> If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Writing Centre](#) for academic skills support.

<sup>2</sup> Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

## Delivery and Resources

### Classes:

- Lectures: There are four one-hour lectures each week.
- SGTA classes: There is one one-hour SGTA class each week.

## Unit Schedule

Week	Algebra	Calculus	Assessment
1	Matrices (Review), Vectors	Limits, Improper Integrals	
2	Linear Combinations, Elementary Matrices	Indeterminate Forms, Continuity	
3	Inverse Matrices	IVT, Newton's Method, Rolle's Thm, MVT	
4	Matrices, LU Decomposition, Determinants	Numerical Integration, Complex Numbers	
5	Determinants, Adjugates	Argand Plane, Polar Form	Test 1
6	Linear Dependence, Vector Spaces & Subspaces	De Moivre's Thm, Polynomials	
7	Bases & Dimension	Polynomials, Taylor Polynomials	
8	Eigenvalues & Eigenvectors	Infinite Series	
9	Eigenspaces & Diagonalisation	Functions of Several Variables	
10	Powers of Matrices, Linear Transformations	Partial Derivatives	

Week	Algebra	Calculus	Assessment
11	Matrix of a Linear Transformations	Directional Derivatives, Extrema, 2nd order ODEs	Test 2
12	Composition of Linear Transformations	Systems of ODEs	Assignment

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central\)](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

Students seeking more policy resources can visit the [Student Policy Gateway \(https://students.mq.edu.au/support/study/student-policy-gateway\)](https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central\)](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/study/getting-started/student-conduct>

## Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit [ask.mq.edu.au](https://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)



## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

### Learning Skills

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- [Getting help with your assignment](#)
- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

## Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

## Student Enquiries

For all student enquiries, visit Student Connect at [ask.mq.edu.au](http://ask.mq.edu.au)

If you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/).

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.