MATH6904

Mathematical Modelling

Session 1, In person-scheduled-weekday, North Ryde 2025

School of Mathematical and Physical Sciences

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General Information

Unit convenor and teaching staff
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Credit points
10

Prerequisites

Corequisites

Co-badged status
math6904

Unit description
This unit introduces students to mathematical techniques from algebra and calculus, focusing on their modern applications in economics, business, and finance, and providing a solid foundation for further study. A key emphasis is on how mathematics models complex real-world problems. The algebra content includes linear systems, matrices, determinants, vector spaces, eigenvalues, and eigenvectors, applied to economic problems like Leontief input-output models and dynamical systems. The calculus content covers differentiation and integration techniques, with applications to constrained and unconstrained optimisation (including multivariable cases) and various approximation methods. These techniques are used to solve a wide range of economic and financial problems.

Learning in this unit enhances student understanding of global challenges identified by the United Nations Sustainable Development Goals (UNSDGs) Good Health and Well Being; Quality Education; Decent Work and Economic Growth; Industry, Innovation and Infrastructure

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: Develop of a range of algebraic skills and proficiency in algebraic techniques

applicable to economics, finance and statistics.

ULO2: Demonstrate knowledge of linear equations and linear models to solve problems in economics, finance and statistics.

ULO3: Apply a wide range of techniques and ideas from differential and integral calculus to the analyse business, economic and financial data.

ULO4: Investigate a range of optimisation problems using the techniques of calculus.

ULO5: Formulate models of a variety of real world situations using techniques from differential equations.

General Assessment Information

Requirements to Pass this Unit

Achieve a total mark equal to or greater than 50% across all assessments.

Late Assessment Submission Penalty

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark of the task) will be applied for each day a written report or presentation assessment is 3not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted.

The submission time for all uploaded assessments is 11:55 pm. A 1-hour grace period will be provided to students who experience a technical concern. For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, please apply for Special Consideration.

Assessments where Late Submissions will be accepted:

- Problems set, skills assessment – YES, Standard Late Penalty applies

Special Consideration

The Special Consideration Policy aims to support students who have been impacted by short-term circumstances or events that are serious, unavoidable and significantly disruptive, and which may affect their performance in assessment. If you experience circumstances or events that affect your ability to complete the assessments in this unit on time, please inform the convenor and submit a Special Consideration request through https://connect.mq.edu.au.

Assessment Tasks

Name	Weighting	Hurdle	Due	Groupwork/Individual	Short Extension	AI Approach
Final examination	50%	No	Exam period		No	
Assignment	20%	No	01/06/2025		No	
Skills exercise	30%	No	06/06/2025		No	

Final examination

Assessment Type [1]: Examination
Indicative Time on Task [2]: 20 hours
Due: **Exam period**
Weighting: **50%**
Groupwork/Individual:
Short extension [3]: No
AI Approach:

The exam will test the ability of students to utilise concepts and techniques learnt in the unit.

On successful completion you will be able to:

- Develop of a range of algebraic skills and proficiency in algebraic techniques applicable to economics, finance and statistics.
- Demonstrate knowledge of linear equations and linear models to solve problems in economics, finance and statistics.
- Apply a wide range of techniques and ideas from differential and integral calculus to the analyse business, economic and financial data.
- Investigate a range of optimisation problems using the techniques of calculus.
- Formulate models of a variety of real world situations using techniques from differential equations.

Assignment

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 12 hours
Due: **01/06/2025**
Weighting: **20%**
Groupwork/Individual:

Short extension [3]: No
AI Approach:

The assignment will test the ability of students to solve mathematical problems using concepts and techniques learnt in the unit.

On successful completion you will be able to:

- Develop of a range of algebraic skills and proficiency in algebraic techniques applicable to economics, finance and statistics.
- Demonstrate knowledge of linear equations and linear models to solve problems in economics, finance and statistics.
- Apply a wide range of techniques and ideas from differential and integral calculus to the analyse business, economic and financial data.
- Investigate a range of optimisation problems using the techniques of calculus.
- Formulate models of a variety of real world situations using techniques from differential equations.

Skills exercise

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 18 hours
Due: **06/06/2025**
Weighting: **30%**
Groupwork/Individual:
Short extension [3]: No
AI Approach:

Exercises designed to develop and assess mathematical skills, reinforcing theoretical knowledge through consistent practice to promote mastery of essential concepts.

On successful completion you will be able to:

- Develop of a range of algebraic skills and proficiency in algebraic techniques applicable to economics, finance and statistics.
- Demonstrate knowledge of linear equations and linear models to solve problems in economics, finance and statistics.
- Apply a wide range of techniques and ideas from differential and integral calculus to the

analyse business, economic and financial data.
- Investigate a range of optimisation problems using the techniques of calculus.
- Formulate models of a variety of real world situations using techniques from differential equations.

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[1] 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
- Academic Success for academic skills support.

[2] Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation.

[3] An automatic short extension is available for some assessments. Apply through the Service Connect Portal.

Delivery and Resources

Classes

Lectures (beginning in Week 1): There are two one-hour lectures each week.

SGTA classes (beginning in Week 2): There is one two-hour sgta each week.

Resources

Algebra

- Lay, Linear Algebra and its Applications, 5th edition.
- Linear Algebra (Waldron, Cherney, and Denton)

Calculus

- Calculus (OpenStax) by Gilbert Strang & Edwin “Jed” Herman (freely available online)
- Stewart, Calculus (Metric Version), 8th edition (other editions are also fine)

Methods of Communication

We will communicate with you via your university email or through announcements on iLearn. Queries to convenors can either be placed on the iLearn discussion board or sent to your lecturers from your university email address.

Unit Schedule

Week	Lecture 01	Lecture 02
1	Sets and Vectors	Dot Product and Orthogonality
2	Matrix Operations	Linear Systems and Gauss-Jordan Elimination
3	Gauss-Jordan Elimination and Consistency	Homogeneous Equations
4	Determinants and Vector/Scalar Product	Equations of Lines
5	Equations of Planes	Functions and Trigonometry
6	Composite and Inverse Functions	Monotonic and Exponential Functions
7	Limits and Continuity	Lmits and Continuity
8	Differentiation	Differentiation
9	Differentiation	Differentiation
10	Integration	Integration
11	Integration	Integration
12	Differential Equations	Differential Equations
13	Revision	Revision

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://policies.mq.edu.au). 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
- Assessment Procedure
- Complaints Resolution Procedure for Students and Members of the Public
- Special Consideration Policy

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

To find other policies relating to Teaching and Learning, visit Policy Central (https://policies.mq.edu.au) and use the search tool.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/admin/other-resources/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 connect.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe academic integrity – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free online writing and maths support, academic skills development and wellbeing consultations.

Student Support

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

Academic Success

Academic Success provides resources to develop your English language proficiency, academic writing, and communication skills.

- Workshops
- Chat with a WriteWISE peer writing leader
- Access StudyWISE
- Upload an assignment to Studiosity
- Complete the 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

Macquarie University offers a range of Student Support Services including:

- IT Support
- Accessibility and disability support with study

- Mental health support
- Safety support to respond to bullying, harassment, sexual harassment and sexual assault
- Social support including information about finances, tenancy and legal issues
- Student Advocacy provides independent advice on MQ policies, procedures, and processes

Student Enquiries

Got a question? Ask us via the Service Connect Portal, or contact Service Connect.

IT Help

For help with University computer systems and technology, visit 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.

Changes from Previous Offering

There are now only three assessments: a skills assessment, report and final exam.

Unit information based on version 2025.06 of the Handbook