MATH6904

Mathematical Modelling

Session 2, Fully online/virtual 2020

Department of Mathematics and Statistics

Contents

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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
The Bui
the.bui@mq.edu.au
12WW 606
Please refer to iLearn

Credit points
10

Prerequisites

Corequisites

Co-badged status

Unit description
This unit introduces students to a range of mathematical techniques from algebra and calculus. Its focus is on the modern application of these ideas, with a particular emphasis on applications to problems in economics, business and finance, and provides a sound mathematical basis for further study in these areas. A key focus of the unit is the development of a sound grasp of how mathematics is used to provide sophisticated modelling of complex real problems. The algebra content of the unit includes topics such as linear systems, matrices, determinants, vector spaces, eigenvalues and eigenvectors. The study of these topics is applied to model various economic problems such as Leontief input-output models and dynamical systems used to predict long-term behaviours. The calculus content includes the development of the techniques of differentiation and integration with applications to constrained and unconstrained optimisation, including multivariable cases, and the development and application of a variety of useful approximation techniques. The techniques studied in the calculus are used to study and solve a wide variety of economic and financial 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: 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

HURDLES: This unit has no hurdle requirements. This means that there are no second chance assessments if you happen to fail at your first attempt.

ASSESSMENT SUBMISSION: Assessment submission will be online through the iLearn page.

Submit assessments online via the appropriate assessment 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.

• Assessment submission is via iLearn. You should upload this as a single scanned PDF file.

• Please note the quick guide on how to upload your assessments provided on the iLearn page.

• Please make sure that each page in your uploaded assessment 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 assessment 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.

Assessment Tasks

Name	Weighting	Hurdle	Due
Project	20%	No	Week 8
Assessed Coursework	40%	No	Will be specified on iLearn
Final Assessment	40%	No	Week 13

Project

Assessment Type [1]: Project
Indicative Time on Task [2]: 20 hours
Due: **Week 8**
Weighting: **20%**

The project is an extended application where students apply the mathematical skills they have learned to model and solve a number of real world problems.

On successful completion you will be able to:

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- 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.

Assessed Coursework

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 20 hours
Due: **Will be specified on iLearn**
Weighting: **40%**

There are ten major topics. Each has an associated online topic quiz containing a number of selected exercises to enable students to demonstrate mastery of the presented techniques and ideas. These are to be completed by the due date specified on iLearn.

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.

Final Assessment

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 20 hours
Due: **Week 13**
Weighting: **40%**

This is a time limited final assessment at the end of the unit covering all the topics studied during the semester. The assessment enables students to apply a wide range of techniques and ideas from algebra and calculus to solve problems in economics, finance and statistics.

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.
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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
- the Writing Centre 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

Delivery and Resources

Classes

This is an online course - there are no classes. The schedule of material that is to be completed is available in iLearn.

Required Texts and Materials

There are two textbooks that are required for this course:

- Margaret Lial, Raymond N. Greenwell & Nathan P. Ritchey: "**Calculus with Applications: Pearson Global Edition"** (11e) (ISBN: 9781488686368)

- Howard Anton & Chris Rorres: "**Elementary Linear Algebra: Applications Version**", 11th Edition (ISBN: 9781118938881)

Access to MyMathLab and WileyPLUS for the two texts is a compulsory requirement. Students will not be able to complete the required assessment tasks without access. Details of access/ textbook options are provided in iLearn.

Technology requirements

Students will require a computer with internet access to enable participation in the course. A calculator with a range of mathematical functions will also be needed. There is no need for a graphing or programmable calculator.

Course material and assessments are provided via the learning management system (iLearn), WileyPlus and Pearson MyMathLab.

Unit Schedule

The following table gives a list of the topics covered in this unit

Topic	Description
1	The Derivative I
2	The Derivative II
3	Integration
4	Functions of two variables
5	Differential Equations
6	Linear Systems and Matrices I
7	Matrices II and applications of linear systems
8	Determinants and Vectors

Topic	Description
9	Vector Spaces
10	Eigenvalues, eigenvectors and more applications

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). 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). 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).

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 or if you are a Global MBA student contact 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) 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

If you are a Global MBA student contact 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/.

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.