# ACST604

## Mathematical Modelling

S2 External 2015

*Dept of Applied Finance and Actuarial Studies*

# Contents

# General Information

Unit convenor and teaching staff
Unit Convenor
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By appointment

Unit Convenor
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Credit points
4

Prerequisites
Admission to MActPrac or MCom or MAcc(Prof)MCom or MBioTechMCom or MAppStat or GradDipAppStat

Corequisites

Co-badged status

Unit description
This unit covers algebra and calculus. The algebra content discusses linearity and applications to geometry. Algebraic techniques involving matrices and determinants are developed and used to study geometrical problems. Linearity is then developed via the notion of vector spaces and used to study systems of linear equations. The notion of a limit is developed and used to study the differential and integral calculus involving functions of one real variable. This is then extended to functions of two real variables. The notion of a limit is enhanced by the study of sequences and series. Numerical techniques for integration are also discussed.

## 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:

Development of a range of algebraic skills and proficiency in algebraic techniques applicable to Economics and Finance

Systematic understanding of linear equations and the properties of linear models applicable to Economics and Finance

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.

# General Assessment Information

No extensions will be granted for any assessment activities. Students who have not submitted a task prior to the deadline for that component will be awarded a mark of 0, except for cases where an application for special consideration is made and approved.

# Assessment Tasks

| Name | Weighting | Due |
| --- | --- | --- |
| Assessed Coursework | 40% | See iLearn |
| Project | 20% | See iLearn |
| Final Assessment | 40% | See iLearn |

## Assessed Coursework

Due: **See iLearn**
Weighting: **40%**

Each major topic has an associated on-line topic quiz containing a number of selected exercises to demonstrate mastery of those techniques and ideas. These are to be completed by the due date specified in iLearn.

On successful completion you will be able to:

• Development of a range of algebraic skills and proficiency in algebraic techniques applicable to Economics and Finance

• Systematic understanding of linear equations and the properties of linear models

applicable to Economics and Finance

- 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.

# Project

Due: **See iLearn**
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:

- 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

Due: **See iLearn**
Weighting: **40%**

This is a time limited (compulsory) final assignment at the end of the course covering all the topics studied during the semester.

On successful completion you will be able to:

- Development of a range of algebraic skills and proficiency in algebraic techniques applicable to Economics and Finance
- Systematic understanding of linear equations and the properties of linear models applicable to Economics and Finance
- 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

# Delivery and Resources

## Classes

• This is an online course - there are no classes. The schedule that material 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 New International Edition**" (10e) (ISBN: 9781486042913)

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

Access to MyMathLab and WileyPLUS for the two texts is also required. Students will not be able to complete the required assessment tasks without access. Details of access 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.

• Course material and assessments are available on the learning management system (iLearn), WileyPlus and Pearson MyMathLab.

# Unit Schedule

Weekly schedule is available in iLearn.

# Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy  http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy http://mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the Learning and Teaching Category of

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/support/student_conduct/

## Results

Results shown in *iLearn*, 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.

# Supplementary Exams

Further information regarding supplementary exams, including dates, is available here http://www.businessandeconomics.mq.edu.au/current_students/undergraduate/how_do_i/special_consideration

# 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 improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

# 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

# IT Help

For help with University computer systems and technology, visit http://informatics.mq.edu.au/help/.

When using the University's IT, you must adhere to the Acceptable Use Policy. The policy applies to all who connect to the MQ network including students.

# Graduate Capabilities

## Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

### Learning outcomes

- Development of a range of algebraic skills and proficiency in algebraic techniques applicable to Economics and Finance
- Systematic understanding of linear equations and the properties of linear models applicable to Economics and Finance
- 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.

### Assessment tasks

- Assessed Coursework
- Project
- Final Assessment

## Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

### Learning outcomes

- Development of a range of algebraic skills and proficiency in algebraic techniques applicable to Economics and Finance

- Systematic understanding of linear equations and the properties of linear models applicable to Economics and Finance
- Apply a wide range of techniques and ideas from differential and integral calculus to the analyse business,economic and financial data
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# Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

## Learning outcomes

- Development of a range of algebraic skills and proficiency in algebraic techniques applicable to Economics and Finance
- Systematic understanding of linear equations and the properties of linear models applicable to Economics and Finance
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# Changes from Previous Offering

A partially online version of this unit was trialled in Session 3 2014. This is the first full online offering of this unit and incorporates the feedback and reflection from students in the trial.

# Compulsory requirements

In order to obtain a passing grade in this unit, students must provide a satisfactory demonstration of the attainment of the learning outcomes in the final assessment.

# Research and Practice

The development of appropriate mathematical models, and and understanding of their properties, together with an appreciation of the underlying assumptions and the impact that any discrepancy between these assumptions and reality may have on the results are key aspects of practice and research in Actuarial science.

This unit focuses on equipping students with these skills and providing opportunities for students to develop and demonstrate these skills through the exploration of a range of techniques applied to case studies. While many of these will be contrived to reduce the complexity to a level that can be analysed with the limited range of tools that can be developed in a one-semester gateway unit, there will be an emphasis on real world problems and the development of good research and professional practice.