MATH1010

Mathematical Modelling IA

Session 2, Special circumstance 2020

Department of Mathematics and Statistics

Contents

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
Frank Valckenborgh
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Contact via email
12WW 613
Please refer to iLearn

Credit points
10

Prerequisites
(HSC Advanced Mathematics Band 4 and above or Extension 1 Band E2 and above or Extension 2) or MATH130 or MATH1000 or WFMA003 or WFMA0003 or WMAT123 or WMAT1000

Corequisites

Co-badged status

Unit description
This is the first mainstream university mathematics unit; it is essential for students in engineering and many areas of science. This subject provides an introduction to basic concepts and techniques in linear algebra and calculus. In algebra, topics covered include matrices, systems of linear equations and their applications, including the use of vectors in two and three-dimensional Euclidean geometry and linear optimisation. In calculus, the concept of a function of one variable is explored, and the notions of limit and continuity are developed. The concept of the derivative as a suitable construct to describe rates of change is defined and techniques of differential and integral calculus of functions of a real variable are developed. Some simple differential equations and their role as quantitative models for dynamic processes, are discussed. Students are also introduced to the use of computers in mathematics, and develop modelling and problem solving skills through 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:** Determine solutions to linear systems of equations using matrix tools and techniques.
>
> **ULO2:** Employ techniques from linear algebra to analyse structures in 2- and 3-D Euclidean space, including vectors, lines and planes.
>
> **ULO3:** Analyze a mathematical problem using concepts of limits, continuity and differentiability.
>
> **ULO4:** Utilise the techniques of differentiation and integration with proficiency to a wide range of functions.
>
> **ULO5:** Evaluate problems from a wide variety of applications and utilise mathematical and computational techniques to solve them.

General Assessment Information

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.

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/FSESupp) 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
Final examination	50%	No	Final exam period
Matlab Assignment	10%	No	Week 12
Major Test 2 (online)	20%	No	Week 11
Major Test 1 (online)	20%	Yes	Week 5

Final examination

Assessment Type [1]: Examination
Indicative Time on Task [2]: 15 hours
Due: **Final 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:

- Determine solutions to linear systems of equations using matrix tools and techniques.

- Employ techniques from linear algebra to analyse structures in 2- and 3-D Euclidean space, including vectors, lines and planes.

- Analyze a mathematical problem using concepts of limits, continuity and differentiability.

- Utilise the techniques of differentiation and integration with proficiency to a wide range of functions.

- Evaluate problems from a wide variety of applications and utilise mathematical and computational techniques to solve them.

Matlab Assignment

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 7 hours
Due: **Week 12**
Weighting: **10%**

The problem set will be aimed at introducing Matlab as a mathematical tool. It will ask students to perform various tasks using Matlab, such as plotting functions, computing derivatives and integrals, performing Gaussian elimination, and solving linear optimisation problems.

On successful completion you will be able to:

- Determine solutions to linear systems of equations using matrix tools and techniques.

- Employ techniques from linear algebra to analyse structures in 2- and 3-D Euclidean space, including vectors, lines and planes.

- Analyze a mathematical problem using concepts of limits, continuity and differentiability.

- Utilise the techniques of differentiation and integration with proficiency to a wide range of functions.

- Evaluate problems from a wide variety of applications and utilise mathematical and computational techniques to solve them.

Major Test 2 (online)

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 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:

- Determine solutions to linear systems of equations using matrix tools and techniques.
- Employ techniques from linear algebra to analyse structures in 2- and 3-D Euclidean space, including vectors, lines and planes.
- Analyze a mathematical problem using concepts of limits, continuity and differentiability.
- Utilise the techniques of differentiation and integration with proficiency to a wide range of functions.
- Evaluate problems from a wide variety of applications and utilise mathematical and computational techniques to solve them.

Major Test 1 (online)

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 7 hours
Due: **Week 5**
Weighting: **20%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

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:

- Determine solutions to linear systems of equations using matrix tools and techniques.
- Employ techniques from linear algebra to analyse structures in 2- and 3-D Euclidean space, including vectors, lines and planes.
- Analyze a mathematical problem using concepts of limits, continuity and differentiability.
- Utilise the techniques of differentiation and integration with proficiency to a wide range of functions.
- Evaluate problems from a wide variety of applications and utilise mathematical and computational techniques to solve them.

[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

- Lectures: There are 4 x 1hr lectures each week
- SGTAs: There is 1 x 1hr SGTA class each week

Course Notes: Student notes will be posted on iLearn.

Suggested textbooks:

- Algebra - *Lay*, Linear Algebra and its Applications, 5th edition.
- Calculus - *Stewart*, Calculus (Metric Version), 8th edition.

Unit Schedule

Week	Algebra	Calculus	Task Due
1	Sets, Matrices	Functions	
2	Matrices, Linear equations	Functions	
3	Linear Equations	Functions	
4	Determinants, vectors	Differentiation: Limits & Continuity	
5	Vectors	Differentiation: Continuity, differentiability	Test 1
6	Vectors, Lines	Differentiation: Techniques; Integration: Sums	
7	Planes	Integration: Sums, definite integral	
8	Optimisation	Integration: Definite Integral, fundamental theorem	
9	Optimisation	Integration: Techniques	

Week	Algebra	Calculus	Task Due
10	Differential Equations	Integration: Techniques	
11	Differential Equations, volumes of revolution	Integration: Techniques	Test 2
12	Volumes of revolution, revision	Integration: Techniques, revision	Assignment
13	Revision	Revision	

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.