FOSE1005

Mathematical Concepts for Science

Session 2, In person-scheduled-weekday, North Ryde 2023

Science and Engineering Faculty level units

Contents

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General Information

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Credit points
10

Prerequisites

Corequisites

Co-badged status

Unit description
An introduction to the basic quantitative methods and techniques common to much of science. You will learn how to formulate scientific problems using mathematical language, use a range of techniques to analyse and solve these problems, and gain an understanding of how to interpret the solutions. Amongst other topics, this unit will cover rates of change, graphical display and interpretation of mathematical concepts, logarithmic and exponential scales, all in the context of scientific measurement and analysis. In the process, this unit introduces vital skills for tertiary learning and explores their relationship to your success in future careers.

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: Analyze problems in multiple science disciplines, at foundation level, using mathematical concepts and techniques.

ULO2: Communicate mathematical concepts in a variety of ways using formal and informal presentations including the use of graphical methods and appropriate software.

ULO3: Identify the mathematical principles underlying basic discipline-specific problems.

ULO4: Create and interpret the content of mathematical models relevant to foundation level science topics.

ULO5: Demonstrate foundational employability and self-directed learning skills, including recording academic achievements to link university study to future careers.

General Assessment Information

Requirements to Pass this Unit To pass this unit you must:

• Achieve each hurdle task, and

• Achieve a total mark equal to or greater than 50%, and

• Participate in a minimum of 8 of the 11 weekly SGTA classes

Hurdle Assessments

- Participation in SGTA classes (weight 0%). Development of knowledge and skills requires continual practice. During SGTAs you will practice a range of mathematical techniques. To pass this hurdle assessment, you must be able to demonstrate your progress in developing and communicating knowledge and skills in 8 of the 11 SGTAs. This is a hurdle assessment meaning that failure to meet this requirement may result in a fail grade for the unit. Students are permitted up to three absences: additional absences will require a Special Consideration to be applied for (see below).

- Employability tasks (weight 0%)

There are 6 employabilty modules, each of which is a hurdle in it own right. Some of the modules, such as the Learner and Collaborator modules, have separate parts each of which must be completed.

- Test 1 (weight 20%)

Test 1 is a hurdle. To achieve the hurdle mark, a mark of at leat 40% is needed. If a mark of between 30% and 40% is received, a second attempt at the test is allowed where again the hurdle mark is 40%; the mark on the second attempt is capped at 40%. If a mark of less than 30% is received on the first attempt, it is not possible to pass the unit.

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 not 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, or not accepted:

• Assignment 1 – YES, Standard Late Penalty applies

• Assignment 2 – YES, Standard Late Penalty applies

• Vodcast – YES, Standard Late Penalty applies

• Test 1 - NO, unless Special Consideration is granted

• Test 2 - NO, unless Special Consideration is granted

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.

Written Assessments/Quizzes/Tests: If you experience circumstances or events that affect your ability to complete the written assessments in this unit on time, please inform the convenor and submit a Special Consideration request through ask.mq.edu.au.

Participation in SGTA classes: To pass the unit you need to demonstrate ongoing development of skills and application of knowledge in 8 out of 11 of the weekly SGTA classes. If you miss a weekly SGTA class due to a serious, unavoidable and significant disruption, contact your convenor ASAP as you may be able to attend another class that week. If it is not possible to attend another class, you should still contact your convenor for access to class material to review in your own time. Note that a Special Consideration should only be applied for if you miss more than three of the weekly SGTA classes.

Assessment Tasks

Name	Weighting	Hurdle	Due
Foundation activities	0%	Yes	Ongoing
Participation in SGTA classes	0%	Yes	Weeks 1-11
Test 1 (online)	20%	Yes	Week 6
Assignment 1	20%	No	Week 7
Test 2 (online)	20%	No	Week 10
Assignment 2	20%	No	Week 11
Vodcast	20%	No	Week 12

Foundation activities

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 0 hours
Due: **Ongoing**
Weighting: **0%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

Activities related to foundational employability and self-directed learning skills

On successful completion you will be able to:

- Demonstrate foundational employability and self-directed learning skills, including recording academic achievements to link university study to future careers.

Participation in SGTA classes

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 0 hours
Due: **Weeks 1-11**
Weighting: **0%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

Development of knowledge and skills requires continual practice. During SGTAs you will practice a range of mathematical techniques. To pass this hurdle assessment, you must be able to demonstrate your progress in developing and communicating knowledge and skills in 10 out of 12 SGTAs.

On successful completion you will be able to:

- Demonstrate foundational employability and self-directed learning skills, including recording academic achievements to link university study to future careers.

Test 1 (online)

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 1 hours
Due: **Week 6**
Weighting: **20%**

This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

This online quiz will test the ability of the students to represent and interpret scientific data and create and manipulate mathematical information in the form of graphical information, data, and equations.

On successful completion you will be able to:

- Analyze problems in multiple science disciplines, at foundation level, using mathematical concepts and techniques.
- Communicate mathematical concepts in a variety of ways using formal and informal presentations including the use of graphical methods and appropriate software.
- Identify the mathematical principles underlying basic discipline-specific problems.
- Create and interpret the content of mathematical models relevant to foundation level science topics.
- Demonstrate foundational employability and self-directed learning skills, including recording academic achievements to link university study to future careers.

Assignment 1

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 6 hours
Due: **Week 7**
Weighting: **20%**

Problems are chosen to explore mathematical concepts and techniques pertaining to the mathematical content of discipline specific material. Students are expected to demonstrate logical mathematical aruments and submit clearly written solutions.

On successful completion you will be able to:

- Analyze problems in multiple science disciplines, at foundation level, using mathematical concepts and techniques.
- Communicate mathematical concepts in a variety of ways using formal and informal presentations including the use of graphical methods and appropriate software.
- Identify the mathematical principles underlying basic discipline-specific problems.
- Create and interpret the content of mathematical models relevant to foundation level

science topics.

- Demonstrate foundational employability and self-directed learning skills, including recording academic achievements to link university study to future careers.

Test 2 (online)

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 1 hours
Due: **Week 10**
Weighting: **20%**

This online quiz will test the ability of the students to recognize, use, and manipulate a variety of mathematical functions, including the use of the derivative and the integral, in the context of discipline-specific problems.

On successful completion you will be able to:

- Analyze problems in multiple science disciplines, at foundation level, using mathematical concepts and techniques.
- Communicate mathematical concepts in a variety of ways using formal and informal presentations including the use of graphical methods and appropriate software.
- Identify the mathematical principles underlying basic discipline-specific problems.
- Create and interpret the content of mathematical models relevant to foundation level science topics.
- Demonstrate foundational employability and self-directed learning skills, including recording academic achievements to link university study to future careers.

Assignment 2

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 6 hours
Due: **Week 11**
Weighting: **20%**

Problems are chosen to explore mathematical concepts and techniques pertaining to the mathematical content of discipline specific material. Students are expected to demonstrate logical mathematical aruments and submit clearly written solutions.

On successful completion you will be able to:
- Analyze problems in multiple science disciplines, at foundation level, using mathematical concepts and techniques.
- Communicate mathematical concepts in a variety of ways using formal and informal presentations including the use of graphical methods and appropriate software.
- Identify the mathematical principles underlying basic discipline-specific problems.
- Create and interpret the content of mathematical models relevant to foundation level science topics.
- Demonstrate foundational employability and self-directed learning skills, including recording academic achievements to link university study to future careers.

Vodcast

Assessment Type [1]: Media presentation
Indicative Time on Task [2]: 5 hours
Due: **Week 12**
Weighting: **20%**

A 3 to 5 minute vodcast prepared in a group of 3 to 4 students, presenting a mathematical model utilizing the content taught in the unit.

On successful completion you will be able to:
- Analyze problems in multiple science disciplines, at foundation level, using mathematical concepts and techniques.
- Communicate mathematical concepts in a variety of ways using formal and informal presentations including the use of graphical methods and appropriate software.
- Identify the mathematical principles underlying basic discipline-specific problems.
- Create and interpret the content of mathematical models relevant to foundation level science topics.
- Demonstrate foundational employability and self-directed learning skills, including recording academic achievements to link university study to future careers.

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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

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

SGTA classes (beginning in Week 1): There is one two-hour SGTA class each week. Students must register in and attend one SGTA per week. Please note that participation in SGTAs is a hurdle requirement, to provide you with the opportunity to demonstrate development of skills and knowledge. If you miss three SGTA classes, you will need to submit and receive Special Consideration or else you risk failing the unit.

Recommended books

No single book covers the content of FOSE1005 precisely. Each of the following books contains material useful and relevant to the unit.

1. Mathematics for Sustainability (free download from Macquarie University internet connection) The book's website.
2. Maths for Chemists
3. Active Prelude to Calculus by Boelkins. Extensive videos here.
4. Active Calculus by Boelkins et al
5. Modeling Life by Garfinkel et al (free download from Macquarie University internet connection)
6. MUMS modules. Material from the Numeracy Centre.
7. Precalculus by Stitz and Zeager. See 3rd corrected edition.
8. Precalculus by Collingwood et al

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.

COVID Information For the latest information on the University's response to COVID-19, please refer to the Coronavirus infection page on the Macquarie website: https://www.mq.edu.au/about/coronavirus-faqs. Remember to check this page regularly in case the information and requirements change during semester. If there are any changes to this unit in relation to COVID, these will be communicated via iLearn.

Unit Schedule

Week	Lecture topic
1	Computation and Measurement

2	Equations, symbolic representation and manipulation
3	Displaying data and interpreting graphs
4	Oscillatory behaviour
5	Growth and decay
6	Rates of change: use and interpretation
7	Calculation of rates of change
Mid Session Break	
8	Optimization
9	Accumulation of change
10	Fundamental Theorem of Calculus: connecting rates of change and accumulated change
11	Employability
12	Employability
13	Employability

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 ask.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/

The Writing Centre

The Writing Centre 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 AskMQ, 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.