MATH1000
Introduction to Mathematical Modelling
Session 1, In person-scheduled-weekday, North Ryde 2023
School of Mathematical and Physical Sciences

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# General Information

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Credit points
10

Prerequisites

Corequisites

Co-badged status

Unit description
This unit is an elementary unit designed for Engineering, Mathematics and Physics students whose mathematics background has not met the recommended standard for students entering these programs. One half of the unit provides an introduction to the ideas and techniques of differentiation and integration which are pervasive in the theoretical and practical models that underpin areas of science, engineering, economics and technology. The other half of the unit develops the algebraic skills and techniques including exponential, logarithmic, and trigonometric functions.

# 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](https://www.mq.edu.au/study/calendar-of-dates)

# Learning Outcomes

On successful completion of this unit, you will be able to:

**ULO2:** Communicate mathematical concepts, pertaining to foundation level science
topics, in a variety of forms including graphically, numerically, in writing and by using equations.

ULO1: Perform calculations, including rates of changes and integrals, of elementary functions used in science and economics (including linear, polynomial, exponential, logarithmic, and trigonometric) and interpret results of these calculations.

ULO3: Apply mathematical reasoning to simple problem solving in the context of elementary algebra and calculus.

ULO4: Test mathematical conjectures involving elementary functions.

ULO5: Demonstrate foundational learning skills including active engagement in the learning process.

ULO6: Create, communicate and interpret the content of mathematical models relevant to foundation level science topics.

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 10 of the 12 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 10 of the 12 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 two absences: additional absences will require a Special Consideration to be applied for (see below).

- Each of the modules 1 to 6 is a hurdle.

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:
Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Hurdle</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation in SGTA classes</td>
<td>0%</td>
<td>Yes</td>
<td>Weekly</td>
</tr>
<tr>
<td>Foundation module test</td>
<td>0%</td>
<td>Yes</td>
<td>At the conclusion of module 1.</td>
</tr>
<tr>
<td>Module tests</td>
<td>100%</td>
<td>Yes</td>
<td>At the conclusion of each module for modules 2 through 6.</td>
</tr>
</tbody>
</table>

Participation in SGTA classes

Assessment Type: Practice-based task
Indicative Time on Task: 0 hours
Due: Weekly
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 learning skills including active engagement in the learning process.

**Foundation module test**
Assessment Type 1: Quiz/Test
Indicative Time on Task 2: 5 hours
Due: At the conclusion of module 1.
Weighting: 0%
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

This unit begins with a module containing foundational material. Students are required to demonstrate mastery of this material, which the remainder of the unit will build upon.

On successful completion you will be able to:

- Perform calculations, including rates of changes and integrals, of elementary functions used in science and economics (including linear, polynomial, exponential, logarithmic, and trigonometric) and interpret results of these calculations.
- Communicate mathematical concepts, pertaining to foundation level science topics, in a variety of forms including graphically, numerically, in writing and by using equations.
- Apply mathematical reasoning to simple problem solving in the context of elementary algebra and calculus.
- Test mathematical conjectures involving elementary functions.
- Demonstrate foundational learning skills including active engagement in the learning process.
- Create, communicate and interpret the content of mathematical models relevant to foundation level science topics.

**Module tests**
Assessment Type 1: Quiz/Test
Indicative Time on Task 2: 25 hours
Due: At the conclusion of each module for modules 2 through 6.
Weighting: 100%
This is a hurdle assessment task (see assessment policy for more information on hurdle
This unit consists of modules. At the end of each module there is a Module test, in which the student is required to demonstrate mastery of the material covered in that module.

On successful completion you will be able to:

• Perform calculations, including rates of changes and integrals, of elementary functions used in science and economics (including linear, polynomial, exponential, logarithmic, and trigonometric) and interpret results of these calculations.

• Communicate mathematical concepts, pertaining to foundation level science topics, in a variety of forms including graphically, numerically, in writing and by using equations.

• Apply mathematical reasoning to simple problem solving in the context of elementary algebra and calculus.

• Test mathematical conjectures involving elementary functions.

• Demonstrate foundational learning skills including active engagement in the learning process.

• Create, communicate and interpret the content of mathematical models relevant to foundation level science topics.

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.

1 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 a one hour lecture each week. SGTA classes (beginning in Week 2): Students must register in and attend one two-hour class per week. This is a hurdle requirement. Missing more than two SGTA classes will result in failure of the unit.

Recommended textbook


As indicated in the title, the text is predominantly calculus. However, Chapter 1 contains
excellent material for non-calculus parts of the unit, covering exponential, logarithms, trigonometry, geometric series and polynomials.

Recommended books
1. Active Prelude to Calculus by Boelkins.
2. Active Calculus by Boelkins et al
3. Modeling Life by Garfunkel et al (free download from Macquarie University internet connection)
4. MUMS modules. Material from the Numeracy Centre.

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
Module 1 (Weeks 1-2)
- Sets
- Algebra skills

Module 2 (Weeks 3-4)
- Common functions
- Domain and range
- Transformations
- Compositions
- Linear functions
- Quadratics
- Polynomials Inequalities

Module 3 (Weeks 5-6)
- Degrees and radians
- Unit circle definition
- Special triangles
- Trig functions
- Inverse trig functions
- Applications

Module 4 (Weeks 7-8)

- Rates of change
- Derivative rules
- The second derivative
- Curve sketching
- Applications

Module 5 (Weeks 9-10)

- Proportionality
- Exponentials
- Logarithms
- Series and Sequences
- Applications

Module 6 (Weeks 11-12)

- Numerical integration
- Fundamental theorem of calculus
- Integration by substitution
- Applications

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
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.