



# MATH13218 *Advanced Applications of Mathematics*

## Term 2 - 2024

Profile information current as at 08/10/2024 09:26 am

All details in this unit profile for MATH13218 have been officially approved by CQU University and represent a learning partnership between the University and you (our student). The information will not be changed unless absolutely necessary and any change will be clearly indicated by an approved correction included in the profile.

## General Information

### Overview

In this unit, you will apply techniques to solve ordinary differential equations (ODEs) from science, engineering, and business domains. You will study the principles of proving for critical thinking and function analysis for logical reasoning in science, engineering and business applications. In this final mathematics unit in the Bachelor of Education (mathematics minor), you will critically analyse strategies and practices in mathematics teaching and assessment design from selected literature.

### Details

Career Level: *Undergraduate*

Unit Level: *Level 3*

Credit Points: 6

Student Contribution Band: 7

Fraction of Full-Time Student Load: 0.125

### Pre-requisites or Co-requisites

Prerequisites: MATH12224 Calculus B or MATH11219 Applied Calculus

Important note: Students enrolled in a subsequent unit who failed their pre-requisite unit, should drop the subsequent unit before the census date or within 10 working days of Fail grade notification. Students who do not drop the unit in this timeframe cannot later drop the unit without academic and financial liability. See details in the [Assessment Policy and Procedure \(Higher Education Coursework\)](#).

### Offerings For Term 2 - 2024

- Online

### Attendance Requirements

All on-campus students are expected to attend scheduled classes - in some units, these classes are identified as a mandatory (pass/fail) component and attendance is compulsory. International students, on a student visa, must maintain a full time study load and meet both attendance and academic progress requirements in each study period (satisfactory attendance for International students is defined as maintaining at least an 80% attendance record).

### Website

[This unit has a website, within the Moodle system, which is available two weeks before the start of term. It is important that you visit your Moodle site throughout the term. Please visit Moodle for more information.](#)

## Class and Assessment Overview

### Recommended Student Time Commitment

Each 6-credit Undergraduate unit at CQUniversity requires an overall time commitment of an average of 12.5 hours of study per week, making a total of 150 hours for the unit.

### Class Timetable

#### [Regional Campuses](#)

Bundaberg, Cairns, Emerald, Gladstone, Mackay, Rockhampton, Townsville

#### [Metropolitan Campuses](#)

Adelaide, Brisbane, Melbourne, Perth, Sydney

### Assessment Overview

#### 1. **Written Assessment**

Weighting: 25%

#### 2. **Written Assessment**

Weighting: 25%

#### 3. **Annotated bibliography**

Weighting: 10%

#### 4. **Examination**

Weighting: 40%

### Assessment Grading

This is a graded unit: your overall grade will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. You must obtain an overall mark for the unit of at least 50%, or an overall grade of 'pass' in order to pass the unit. If any 'pass/fail' tasks are shown in the table above they must also be completed successfully ('pass' grade). You must also meet any minimum mark requirements specified for a particular assessment task, as detailed in the 'assessment task' section (note that in some instances, the minimum mark for a task may be greater than 50%). Consult the [University's Grades and Results Policy](#) for more details of interim results and final grades.

## CQUniversity Policies

**All University policies are available on the [CQUniversity Policy site](#).**

You may wish to view these policies:

- Grades and Results Policy
- Assessment Policy and Procedure (Higher Education Coursework)
- Review of Grade Procedure
- Student Academic Integrity Policy and Procedure
- Monitoring Academic Progress (MAP) Policy and Procedure – Domestic Students
- Monitoring Academic Progress (MAP) Policy and Procedure – International Students
- Student Refund and Credit Balance Policy and Procedure
- Student Feedback – Compliments and Complaints Policy and Procedure
- Information and Communications Technology Acceptable Use Policy and Procedure

This list is not an exhaustive list of all University policies. The full list of University policies are available on the [CQUniversity Policy site](#).

## Previous Student Feedback

### Feedback, Recommendations and Responses

Every unit is reviewed for enhancement each year. At the most recent review, the following staff and student feedback items were identified and recommendations were made.

#### Feedback from Student Evaluations and Unit Coordinator Reflections

**Feedback**

Most students appreciated the challenging but enjoyable journey of their mathematics study.

**Recommendation**

Continue to offer a positive supported learning experience.

#### Feedback from Discipline Leader (Mathematics and Statistics)

**Feedback**

Update the unit Moodle site.

**Recommendation**

Add detailed weekly study instructions and supporting resources to the unit Moodle site.

## Unit Learning Outcomes

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

1. Apply principles of proving for critical thinking
2. Use function analysis for logical reasoning in science, engineering, and business applications
3. Solve ordinary differential equations with different techniques in science, engineering, and business domains
4. Critically analyse strategies and practices in mathematics teaching and assessment design from selected literature.

## Alignment of Learning Outcomes, Assessment and Graduate Attributes



### Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes			
	1	2	3	4
1 - Written Assessment - 25%	•	•		
2 - Written Assessment - 25%			•	
3 - Annotated bibliography - 10%				•
4 - Examination - 40%	•	•	•	

### Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes			
	1	2	3	4
1 - Communication				•
2 - Problem Solving	•	•	•	
3 - Critical Thinking	•	•	•	•
4 - Information Literacy	•	•	•	•
5 - Team Work				
6 - Information Technology Competence	•	•	•	•
7 - Cross Cultural Competence				
8 - Ethical practice				
9 - Social Innovation				
10 - Aboriginal and Torres Strait Islander Cultures				

### Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes									
	1	2	3	4	5	6	7	8	9	10
1 - Written Assessment - 25%	•	•	•	•		•				
2 - Written Assessment - 25%	•	•	•	•		•				
3 - Annotated bibliography - 10%	•	•	•	•		•				
4 - Examination - 40%	•	•	•							

## Textbooks and Resources

### Textbooks

MATH13218

#### Prescribed

#### Advanced Mathematics for Engineering and Applied Sciences

Edition: 4th (2019)

Authors: William Guo & Yucang Wang

Pearson

Melbourne, Victoria, Australia

ISBN: 9780655700579

Binding: Paperback

[View textbooks at the CQUniversity Bookshop](#)

### IT Resources

#### You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- Access to a document scanner and/or pdf converter (all assessment submitted electronically as pdf file) (Mandatory)
- Access to a printer (for printing assessment and tutorial materials)
- Access to a webcam, speaker and microphone or a headset. (For participating in Zoom lectures and tutorials.)

## Referencing Style

All submissions for this unit must use the referencing style: [Harvard \(author-date\)](#)

For further information, see the Assessment Tasks.

## Teaching Contacts

**Dushyant Tanna** Unit Coordinator

[d.tanna@cqu.edu.au](mailto:d.tanna@cqu.edu.au)

## Schedule

### Week 1 - 08 Jul 2024

Module/Topic	Chapter	Events and Submissions/Topic
Unit introduction Introduction to Ordinary Differential Equations (ODEs)	Sections 1.1-1.2.1 in Advanced Mathematics for Engineering and Applied Sciences (4th) (4th AMEAS)	Sections 1.1-1.2.1 Complete Week 1 Exercises

### Week 2 - 15 Jul 2024

Module/Topic	Chapter	Events and Submissions/Topic
Separation of Variables	Sections 1.2.2-1.2.3 in 4th AMEAS	Sections 1.2.2-1.2.3 Complete Week 2 Exercises

### Week 3 - 22 Jul 2024

Module/Topic	Chapter	Events and Submissions/Topic
First-Order Ordinary Linear Differential Equations (ODEs)	Section 1.3 in 4th AMEAS	Section 1.3 Complete Week 3 Exercises

**Week 4 - 29 Jul 2024**

Module/Topic	Chapter	Events and Submissions/Topic
Numeric Methods for Ordinary Differential Equations	Section 4.4.1 in 4th AMEAS	Section 4.4.1 Complete Week 4 Exercises

**Week 5 - 05 Aug 2024**

Module/Topic	Chapter	Events and Submissions/Topic
2nd-Order Constant-Coefficient Homogeneous Linear ODEs	Sections 1.4.1-1.4.2 in 4th AMEAS	Sections 1.4.1-1.4.2 Complete Week 5 Exercises  <b>Assignment 1</b> Due: Week 5 Friday (9 Aug 2024) 11:59 pm AEST

**Vacation Week - 12 Aug 2024**

Module/Topic	Chapter	Events and Submissions/Topic
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**Week 6 - 19 Aug 2024**

Module/Topic	Chapter	Events and Submissions/Topic
2nd-Order Constant-Coefficient Inhomogeneous Linear ODEs (1)	Section 1.4.3 in 4th AMEAS	Section 1.4.3 Complete Week 6 Exercises

**Week 7 - 26 Aug 2024**

Module/Topic	Chapter	Events and Submissions/Topic
2nd-Order Constant-Coefficient Inhomogeneous Linear ODEs (2)	Section 1.4.3 in 4th AMEAS	Section 1.4.3 Complete Week 7 Exercises

**Week 8 - 02 Sep 2024**

Module/Topic	Chapter	Events and Submissions/Topic
Euler Equations and Systems of Linear ODEs	Section 1.5 in 4th AMEAS	Section 1.5 Complete Week 8 Exercises

**Week 9 - 09 Sep 2024**

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to Mathematical Modelling	Section 1.6 (selected applications) in 4th AMEAS	Section 1.6 Complete Week 9 Exercises

**Week 10 - 16 Sep 2024**

Module/Topic	Chapter	Events and Submissions/Topic
Literature analysis: Principles and Good Practices of Effective Teaching in Mathematics	Selected articles in effective teaching in mathematics	Read the selected articles; prepare annotated bibliography (Part A)  <b>Assignment 2</b> Due: Week 10 Friday (20 Sept 2024) 11:59 pm AEST

**Week 11 - 23 Sep 2024**

Module/Topic	Chapter	Events and Submissions/Topic
Literature analysis: Strategies and Good Practices in Mathematical Learning Assessment	Selected articles in effective mathematical learning assessment	Read the selected articles; prepare annotated bibliography (Part B)

**Week 12 - 30 Sep 2024**

Module/Topic	Chapter	Events and Submissions/Topic
Exam Preview and Preparation	Exam Preview and Preparation	

**Review/Exam Week - 07 Oct 2024**

Module/Topic	Chapter	Events and Submissions/Topic
		<b>Annotated bibliography</b> Due: Review/Exam Week Wednesday (9 Oct 2024) 11:59 pm AEST

Module/Topic	Chapter	Events and Submissions/Topic
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## Term Specific Information

Unit Coordinator: Dushyant Tanna

email: d.tanna@cqu.edu.au

Telephone (Office): 07 4930 9821

Office: School of Engineering and Technology, CQUniversity Australia, Building 30/G0.10, Bruce Highway, North Rockhampton Qld, 4701

If you have any individual queries, please do not hesitate to email me and I will get back to you within two working days.

## Assessment Tasks

### 1 Assignment 1

#### Assessment Type

Written Assessment

#### Task Description

This is an individual assignment.

Questions on topics covered in Weeks 1-4. Please see the unit website for the questions in this assignment.

#### Assessment Due Date

Week 5 Friday (9 Aug 2024) 11:59 pm AEST

#### Return Date to Students

Week 7 Friday (30 Aug 2024)

It is envisaged that feedback and solutions will be available in two weeks, or as soon as the marking process is completed.

#### Weighting

25%

#### Assessment Criteria

The final mark is out of 25. Questions are awarded the full marks allocated if they are error-free, partial marks if there are some problems, and no marks if not attempted or contain so many errors as to render the attempt to be without value. To ensure maximum benefit, answers to all questions should be neatly and clearly presented and all appropriate working should be shown.

#### Referencing Style

- [Harvard \(author-date\)](#)

#### Submission

Online

#### Submission Instructions

Submit one PDF or word file through the Moodle website.

#### Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- Information Technology Competence

#### Learning Outcomes Assessed

- Apply principles of proving for critical thinking
- Use function analysis for logical reasoning in science, engineering, and business applications

## 2 Assignment 2

### Assessment Type

Written Assessment

### Task Description

This is an individual assignment.

Questions on topics covered in Weeks 5-9. Please see the unit website for the questions in this assignment.

### Assessment Due Date

Week 10 Friday (20 Sept 2024) 11:59 pm AEST

### Return Date to Students

Review/Exam Week Friday (11 Oct 2024)

It is envisaged that feedback and solutions will be available in two weeks, or as soon as the marking process is completed.

### Weighting

25%

### Assessment Criteria

The final mark is out of 25. Questions are awarded the full marks allocated if they are error-free, partial marks if there are some problems, and no marks if not attempted or contain so many errors as to render the attempt to be without value. To ensure maximum benefit, answers to all questions should be neatly and clearly presented and all appropriate working should be shown.

### Referencing Style

- [Harvard \(author-date\)](#)

### Submission

Online

### Submission Instructions

Submit one PDF or word file through the Moodle website.

### Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- Information Technology Competence

### Learning Outcomes Assessed

- Solve ordinary differential equations with different techniques in science, engineering, and business domains

## 3 Annotated bibliography

### Assessment Type

Annotated bibliography

### Task Description

This is an individual assignment.

Students will be assigned a few selected references in mathematics teaching and learning assessment for analyzing. The outcomes of analysis should be documented as a concise and insightful report in the form of annotated bibliography for submission.

### Assessment Due Date

Review/Exam Week Wednesday (9 Oct 2024) 11:59 pm AEST

Upon lodging a formal request for extension, students would have a chance to be granted an extension up to two weeks. Should you do so, be aware of potential interference to your exam during this period.

### Return Date to Students

It is envisaged that the feedback and marks will be available as soon as the marking process is completed.



**Weighting**

10%

**Assessment Criteria**

The final mark for this assignment is out of 10. The report should comprise two parts for mathematics teaching and learning assessment. Each part should be between 500 to 1000 words. Please avoid making your report excessively long or too short, as the selected references are tailored to address specific issues.

Marks are awarded based on: 1) the level of your understanding of the approach, the practice, the experience, the issue, the points or alike proposed/shared/raised in the reference; 2) your OWN comments on or opinions/thoughts/criticism of the reported outcomes (could be methods, conclusions, opinions, positions, claims etc.); 3) your OWN reflection on whether anything reported in the reference would be adaptable to or modifiable for your current or future teaching and learning practices.

Please note that your position (agree, partly agree or disagree) on the reference is not part of the marking criteria. Your logical discourse, insightful analysis, or evidence-based articulation is more important. Simply disagreeing/agreeing to the outcomes of a reference without your own reflection is not sufficient or appropriate.

**Referencing Style**

- [Harvard \(author-date\)](#)

**Submission**

Online

**Submission Instructions**

Submit one PDF or word file through the Moodle website.

**Graduate Attributes**

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- Information Technology Competence

**Learning Outcomes Assessed**

- Critically analyse strategies and practices in mathematics teaching and assessment design from selected literature.

## Examination

**Outline**

Complete an invigilated examination.

**Date**

During the examination period at a CQUniversity examination centre.

**Weighting**

40%

**Length**

180 minutes

**Minimum mark or grade**

16 (40% of 40 marks)

**Exam Conditions**

Open Book.

**Materials**

Dictionary - non-electronic, concise, direct translation only (dictionary must not contain any notes or comments).  
Calculator - all non-communicable calculators, including scientific, programmable and graphics calculators are authorised

## Academic Integrity Statement

As a CQUniversity student you are expected to act honestly in all aspects of your academic work.

Any assessable work undertaken or submitted for review or assessment must be your own work. Assessable work is any type of work you do to meet the assessment requirements in the unit, including draft work submitted for review and feedback and final work to be assessed.

When you use the ideas, words or data of others in your assessment, you must thoroughly and clearly acknowledge the source of this information by using the correct referencing style for your unit. Using others' work without proper acknowledgement may be considered a form of intellectual dishonesty.

Participating honestly, respectfully, responsibly, and fairly in your university study ensures the CQUniversity qualification you earn will be valued as a true indication of your individual academic achievement and will continue to receive the respect and recognition it deserves.

As a student, you are responsible for reading and following CQUniversity's policies, including the [Student Academic Integrity Policy and Procedure](#). This policy sets out CQUniversity's expectations of you to act with integrity, examples of academic integrity breaches to avoid, the processes used to address alleged breaches of academic integrity, and potential penalties.

### What is a breach of academic integrity?

A breach of academic integrity includes but is not limited to plagiarism, self-plagiarism, collusion, cheating, contract cheating, and academic misconduct. The Student Academic Integrity Policy and Procedure defines what these terms mean and gives examples.

### Why is academic integrity important?

A breach of academic integrity may result in one or more penalties, including suspension or even expulsion from the University. It can also have negative implications for student visas and future enrolment at CQUniversity or elsewhere. Students who engage in contract cheating also risk being blackmailed by contract cheating services.

### Where can I get assistance?

For academic advice and guidance, the [Academic Learning Centre \(ALC\)](#) can support you in becoming confident in completing assessments with integrity and of high standard.

### What can you do to act with integrity?



#### Be Honest

If your assessment task is done by someone else, it would be dishonest of you to claim it as your own



#### Seek Help

If you are not sure about how to cite or reference in essays, reports etc, then seek help from your lecturer, the library or the Academic Learning Centre (ALC)



#### Produce Original Work

Originality comes from your ability to read widely, think critically, and apply your gained knowledge to address a question or problem