MATH13218 *Advanced Applications of Mathematics*

Term 2 - 2022

Profile information current as at 19/04/2024 08:19 am

All details in this unit profile for MATH13218 have been officially approved by CQUniversity 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 - 2022

- 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 requests

Feedback

A few students asked for opening the face-to-face class in Rockhampton along with the online zoom class.

Recommendation

Investigate opening face-to-face classes in Rockhampton if more students are able to attend such classes regularly in the future

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

— N/A Level | • Introductory Level | • Intermediate Level | • Graduate Level | ◦ Professional Level | ◦ Advanced Level

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	•	•	•	

Graduate Attributes	Learning Outcomes			
	1	2	3	4
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

There are no required textbooks.

Additional Textbook Information
The textbook is the same book used in MATH13217. If you're new to CQU education mathematics, you may purchase a copy of the book from the CQU Bookshop: Advanced Mathematics for Engineering and Applied Sciences (4th Ed) by William Guo and Yucang Wang, published by Pearson in 2019.

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)

Referencing Style

All submissions for this unit must use the referencing style: Harvard (author-date)
For further information, see the Assessment Tasks.

Teaching Contacts

William Guo Unit Coordinator
w.guo@cqu.edu.au

Schedule

Week 1 - 11 Jul 2022

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 - 18 Jul 2022

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 - 25 Jul 2022

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 - 01 Aug 2022

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 - 08 Aug 2022

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 **Assignment 1** Due: Week 5 Friday (12 Aug 2022) 11:59 pm AEST

Vacation Week - 15 Aug 2022

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 22 Aug 2022

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 - 29 Aug 2022

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 - 05 Sep 2022

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 - 12 Sep 2022		
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 - 19 Sep 2022		
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) **Assignment 2** Due: Week 10 Friday (23 Sept 2022) 11:59 pm AEST
Week 11 - 26 Sep 2022		
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 - 03 Oct 2022		
Module/Topic	**Chapter**	**Events and Submissions/Topic**
Exam Preview and Preparation	Exam Preview and Preparation	
Review/Exam Week - 10 Oct 2022		
Module/Topic	**Chapter**	**Events and Submissions/Topic**
		Annotated bibliography Due: Review/Exam Week Wednesday (12 Oct 2022) 11:59 pm AEST
Exam Week - 17 Oct 2022		
Module/Topic	**Chapter**	**Events and Submissions/Topic**

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 (12 Aug 2022) 11:59 pm AEST

Return Date to Students
Week 7 Friday (2 Sept 2022)
It is envisaged that feedback and solutions will be available in two weeks, or as soon as the 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.

Learning Outcomes Assessed

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

Graduate Attributes

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

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 (23 Sept 2022) 11:59 pm AEST

Return Date to Students
Week 12 Friday (7 Oct 2022)
It is envisaged that feedback and solutions will be available in two weeks, or as soon as the 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.

Learning Outcomes Assessed

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

Graduate Attributes

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

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 (12 Oct 2022) 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
Exam Week Friday (21 Oct 2022)
It is envisaged that the feedback and marks will be available as soon as the latest submissions are marked.

Weighting
10%

Assessment Criteria
The final mark for this assignment is out of 10. The report should be comprised of two parts for mathematics teaching and learning assessment, respectively. Each part is expected to be within 500-1000 words. Extra long or far short report is not encouraged as the selected references would focus on certain 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 adoptable 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. It is your logical discourse, or insightful analysis, or evidence-based articulation that is more important. Simply disagreeing/agreeing to the outcomes of a reference without your own reflection is not good enough.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Submit one PDF or word file through the Moodle website.

Learning Outcomes Assessed

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

Graduate Attributes

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

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