



MATH12222 *Advanced Mathematical Applications*

Term 1 - 2022

Profile information current as at 26/04/2024 08:07 pm

All details in this unit profile for MATH12222 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

Techniques of advanced mathematics and applications are developed through a selection of various methods to solve linear and non-linear differential equations in science and engineering. You will study interpolation, curve fitting, and utilise the concepts of linear transformations and interpretation of eigenvalues to analyse a variety of scientific and engineering problems. Numerical methods for solving ordinary differential equations, the Fourier Analysis of periodic and non-periodic functions and partial differential equations with initial and boundary conditions are included. You will communicate results, concepts and ideas using mathematics as a language and be able to document the solution to problems in a way that demonstrates a clear, logical and precise approach.

Details

Career Level: *Undergraduate*

Unit Level: *Level 2*

Credit Points: 6

Student Contribution Band: 7

Fraction of Full-Time Student Load: 0.125

Pre-requisites or Co-requisites

Pre-requisite: MATH11219

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 1 - 2022

- Bundaberg
- Cairns
- Gladstone
- Mackay
- Online
- Rockhampton

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: 20%

2. **Written Assessment**

Weighting: 20%

3. **Examination**

Weighting: 60%

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 evaluation

Feedback

Sufficient learning & teaching material provided.

Recommendation

Provide the same amount of learning resources.

Feedback from Student evaluation

Feedback

Good split of exams and assignments.

Recommendation

Continue to maintain a similar mix of assessment items.

Feedback from In class

Feedback

It would be better to have face-to-face tutorial support.

Recommendation

Look into providing face-to-face on-campus tutorial support.

Feedback from In-class

Feedback

Students were appreciative for providing individual attention, keeping frequent engagement, providing the tutorial solutions with appropriate scaffolding.

Recommendation

Continue to provide individual support, and add guidelines to students on how to seek individual support so all students can take advantage of it.

Unit Learning Outcomes

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

1. Model engineering application problems by applying interpolation and curve fitting techniques
2. Analyse problems using the concepts of linear transformation and the interpretation of eigenvalues
3. Use numerical methods to solve ordinary differential equations
4. Apply Fourier Analysis to periodic and non-periodic functions in the solution of scientific and engineering problems
5. Solve simple partial differential equations with initial and boundary conditions
6. Communicate results, concepts and ideas in context using mathematics as a language.

The Learning Outcomes for this unit are linked with the Engineers Australia Stage 1 Competency Standards for Professional Engineers in the areas of 1. Knowledge and Skill Base, 2. Engineering Application Ability and 3. Professional and Personal Attributes at the following levels:

Introductory

1.4 Discernment of knowledge development and research directions within the engineering discipline. (LO: 1N 3N)

2.3 Application of systematic engineering synthesis and design processes. (LO: 1N)

Intermediate

1.1 Comprehensive, theory-based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline. (LO: 1I 2I 3I 4I 5N)

1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline. (LO: 1I 2I 3I 4I)

2.2 Fluent application of engineering techniques, tools and resources. (LO: 1I 2I 3I 4N 5N)

3.2 Effective oral and written communication in professional and lay domains. (LO: 6I)

3.4 Professional use and management of information. (LO: 6I)

Advanced

1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline. (LO: 1A 2A 3A 4A 5I 6I)

1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline. (LO: 1I 3I 4A 5I)

1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline. (LO: 1A)

2.1 Application of established engineering methods to complex engineering problem solving. (LO: 1I 2A 3I 4I 5N)

Note: LO refers to the Learning Outcome number(s) which link to the competency and the levels: N - Introductory, I - Intermediate and A - Advanced.

Refer to the Engineering Undergraduate Course Moodle site for further information on the Engineers Australia's Stage 1 Competency Standard for Professional Engineers and course level mapping information <https://moodle.cqu.edu.au/course/view.php?id=1511>

Alignment of Learning Outcomes, Assessment and Graduate Attributes



Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes					
	1	2	3	4	5	6
1 - Written Assessment - 20%		•				•
2 - Written Assessment - 20%	•		•			•
3 - Examination - 60%	•	•	•	•	•	

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes					
	1	2	3	4	5	6
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						

Textbooks and Resources

Textbooks

MATH12222

Prescribed

Advanced Mathematics for Engineering and Applied Sciences

Fourth Edition (2019)

Authors: William W. Guo, Yucang Wang

Pearson

Melbourne , VIC , 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)

Referencing Style

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

For further information, see the Assessment Tasks.

Teaching Contacts

Shaminda De Silva Unit Coordinator

s.desilva@cqu.edu.au

Schedule

Week 1 - 07 Mar 2022

Module/Topic	Chapter	Events and Submissions/Topic
Ordinary differential equations (ODEs) - 1	Sections 1.1-1.3	Exercises 1.1-1.3

Week 2 - 14 Mar 2022

Module/Topic	Chapter	Events and Submissions/Topic
Ordinary differential equations (ODEs) - 2	Section 1.4	Exercises 1.4

Week 3 - 21 Mar 2022

Module/Topic	Chapter	Events and Submissions/Topic
Ordinary differential equations (ODEs) - 3	Sections 1.5-1.6	Exercises 1.5-1.6

Week 4 - 28 Mar 2022

Module/Topic	Chapter	Events and Submissions/Topic
Linear algebra and applications - 1	Sections 2.1-2.3	Exercises 2.1-2.3

Week 5 - 04 Apr 2022

Module/Topic	Chapter	Events and Submissions/Topic
Linear algebra and applications - 2	Section 2.4	Exercises 2.4
Vacation Week - 11 Apr 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Week 6 - 18 Apr 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Laplace transforms - 1	Sections 3.1-3.2	Exercises 3.1-3.2
		Written Assessment Due: Week 6 Wednesday (20 Apr 2022) 11:00 pm AEST
Week 7 - 25 Apr 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Laplace transforms - 2	Sections 3.3-3.4	Exercises 3.3-3.4
Week 8 - 02 May 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Numeric methods - 1	Sections 4.1-4.2	Exercises 4.1-4.2
Week 9 - 09 May 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Numeric methods - 2	Sections 4.3-4.4	Exercises 4.3-4.4
Week 10 - 16 May 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Fourier series - 1	Sections 5.1- 5.2	Exercises 5.1-5.2
		Written Assessment Due: Week 10 Wednesday (18 May 2022) 11:00 pm AEST
Week 11 - 23 May 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Fourier series - 2	Sections 5.3-5.4	Exercises 5.3-5.4
Week 12 - 30 May 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Partial differential equations (PDEs)	Sections 6.1-6.2 + Review	Exercises 6.1
Review/Exam Week - 06 Jun 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Exam Week - 13 Jun 2022		
Module/Topic	Chapter	Events and Submissions/Topic

Assessment Tasks

1 Written Assessment

Assessment Type

Written Assessment

Task Description

Questions on ODEs and linear algebra covered in Weeks 1-5. Please see the unit website for the questions in this

assignment.

Assessment Due Date

Week 6 Wednesday (20 Apr 2022) 11:00 pm AEST

Return Date to Students

Week 8 Wednesday (4 May 2022)

We strive to release the assessment marks in 2 weeks after due date.

Weighting

20%

Assessment Criteria

This is an individual assignment.

The final mark is out of 20. Questions are from contents covered in Weeks 1-5. Questions are awarded 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

Assignment 1 is submitted through Moodle. Submit your answers as a single pdf file by collating all your workings and solutions.

Learning Outcomes Assessed

- Analyse problems using the concepts of linear transformation and the interpretation of eigenvalues
- Communicate results, concepts and ideas in context using mathematics as a language.

Graduate Attributes

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

2 Written Assessment

Assessment Type

Written Assessment

Task Description

Questions on Laplace transforms and and Numeric methods covered in Weeks 6-9. Please see the unit website for the questions in this assignment.

Assessment Due Date

Week 10 Wednesday (18 May 2022) 11:00 pm AEST

Return Date to Students

Week 12 Wednesday (1 June 2022)

We strive to release the assessment marks in 2 weeks after due date.

Weighting

20%

Assessment Criteria

This is an individual assignment.

The final mark is out of 20. Questions are from contents covered in Weeks 6-9. 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

Assignment 2 is submitted through Moodle. Submit your answers as a single pdf file by collating all your workings and solutions.

Learning Outcomes Assessed

- Model engineering application problems by applying interpolation and curve fitting techniques
- Use numerical methods to solve ordinary differential equations
- Communicate results, concepts and ideas in context using mathematics as a language.

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

60%

Length

180 minutes

Minimum mark or grade

50%

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