General Information

Unit convenor and teaching staff
Christopher Lustri
christopher.lustri@mq.edu.au

Justin Tzou
justin.tzou@mq.edu.au

Credit points
10

Prerequisites
(MATH2010 or MATH235) and (MATH2020 or MATH2110 or MATH232 or MATH236)

Corequisites
MATH3901 or MATH3902 or MATH3905 or MATH3909 or MATH331 or MATH332 or
MATH335 or MATH339

Co-badged status

Unit description
Partial differential equations form one of the most fundamental links between pure and applied mathematics. Many problems that arise naturally from physics and other sciences can be described by partial differential equations. Their study gives rise to the development of many mathematical techniques, and their solutions enrich both mathematics and their areas of origin. This unit explores how partial differential equations arise as models of real physical phenomena, and develops various techniques for solving them and characterising their solutions. Special attention is paid to three partial differential equations that have been central in the development of mathematics and the sciences - Laplace's equation, the wave equation and the diffusion equation.

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: Have knowledge of the principles and concepts of a basic theory of partial differential equations.
ULO2: Use the ideas and techniques of the theory of partial differential equations to model a broad range of phenomena in science and engineering (in particular using the heat and wave equations).

ULO3: Understand the breadth of the theory of partial differential equations and its role in other fields.

ULO4: Construct logical, clearly presented and justified mathematical arguments incorporating deductive reasoning especially in the context of the theory of partial differential equations.

ULO5: Demonstrate efficient use of Fourier analysis techniques in the theory of partial differential equations.

ULO6: Further studies in the areas of partial differential equations and advanced analysis.

**General Assessment Information**

**HURDLES:** This subject does not have any hurdle requirements.

**ASSIGNMENT SUBMISSION:** Assignment submission will be online through the iLearn page.

Submit assignments online via the appropriate assignment link on the iLearn page. A personalised cover sheet is not required with online submissions. Read the submission statement carefully before accepting it as there are substantial penalties for making a false declaration.

- Assignment submission is via iLearn. You should upload this as a single scanned PDF file.
- Please note the quick guide on how to upload your assignments provided on the iLearn page.
- Please make sure that each page in your uploaded assignment corresponds to only one A4 page (do not upload an A3 page worth of content as an A4 page in landscape). If you are using an app like Clear Scanner, please make sure that the photos you are using are clear and shadow-free.
- It is your responsibility to make sure your assignment submission is legible.
- If there are technical obstructions to your submitting online, please email us to let us know.

You may submit as often as required prior to the due date/time. Please note that each submission will completely replace any previous submissions. It is in your interests to make frequent submissions of your partially completed work as insurance against technical or other problems near the submission deadline.

**LATE SUBMISSION OF WORK:**
From 1 July 2022, Students enrolled in Session based units with written assessments will have the following late penalty applied. Please see https://students.mq.edu.au.study/assessment-exams/assessments for more information.

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark) will be applied each day a written 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. Submission time for all written assessments is set at 11:55 pm. A 1-hour grace period is 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, students need to submit an application for Special Consideration.

In this unit, late submissions will accepted as follows:

- Assignments – YES, Standard Late Penalty applies
- Midterm test, final exam – NO, unless Special Consideration is granted

**FINAL EXAM POLICY:** It is Macquarie University policy not to set early examinations for individuals or groups of students. All students are expected to ensure that they are available until the end of the teaching semester, that is, the final day of the official examination period. The only excuse for not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these special circumstances, you may apply for special consideration via ask.mq.edu.au.

If you receive special consideration for the final exam, a supplementary exam will be scheduled in the interval between the regular exam period and the start of the next session. By making a special consideration application for the final exam you are declaring yourself available for a resit during this supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application.

You can check the supplementary exam information page on FSE101 in iLearn (bit.ly/FSESupp) for dates, and approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.
Final exam

Assessment Type 1: Examination
Indicative Time on Task 2: 20 hours
Due: Exam Period
Weighting: 60%

This will be held during the final exam period. It will test the ability of students to synthesise the concepts taught in the course in order to analyse and solve partial differential equations.

On successful completion you will be able to:

- Have knowledge of the principles and concepts of a basic theory of partial differential equations.
- Use the ideas and techniques of the theory of partial differential equations to model a broad range of phenomena in science and engineering (in particular using the heat and wave equations).
- Understand the breadth of the theory of partial differential equations and its role in other fields.
- Construct logical, clearly presented and justified mathematical arguments incorporating deductive reasoning especially in the context of the theory of partial differential equations.
- Demonstrate efficient use of Fourier analysis techniques in the theory of partial differential equations.
- Further studies in the areas of partial differential equations and advanced analysis.

Assignment 2

Assessment Type 1: Problem set
Indicative Time on Task 2: 9 hours
Due: Week 11
Weighting: 15%

Assignment based on material from lectures in previous weeks.

On successful completion you will be able to:

- Have knowledge of the principles and concepts of a basic theory of partial differential
On successful completion you will be able to:

- Have knowledge of the principles and concepts of a basic theory of partial differential equations.
- Use the ideas and techniques of the theory of partial differential equations to model a broad range of phenomena in science and engineering (in particular using the heat and wave equations).
- Understand the breadth of the theory of partial differential equations and its role in other fields.
- Construct logical, clearly presented and justified mathematical arguments incorporating deductive reasoning especially in the context of the theory of partial differential equations.
- Demonstrate efficient use of Fourier analysis techniques in the theory of partial differential equations.
- Further studies in the areas of partial differential equations and advanced analysis.
Assignment 1

Assessment Type 1: Problem set
Indicative Time on Task 2: 9 hours
Due: Week 6
Weighting: 15%

Assignment based on material from lectures in previous weeks.

On successful completion you will be able to:

- Have knowledge of the principles and concepts of a basic theory of partial differential equations.
- Use the ideas and techniques of the theory of partial differential equations to model a broad range of phenomena in science and engineering (in particular using the heat and wave equations).
- Understand the breadth of the theory of partial differential equations and its role in other fields.
- Construct logical, clearly presented and justified mathematical arguments incorporating deductive reasoning especially in the context of the theory of partial differential equations.
- Demonstrate efficient use of Fourier analysis techniques in the theory of partial differential equations.
- Further studies in the areas of partial differential equations and advanced analysis.

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: There is one two-hour lecture each week.
SGTA classes: Students must register in and attend one one-hour class per week.

Required Textbook
The required textbook for this unit is: *Introduction to Partial Differential Equations* (Peter J. Olver)

This text is available free and online through the MQ library service. Please ensure that you have this text available to you. We will assign readings, and draw questions and examples from this text. Most of the lectures will be directly based on the contents of this text.

Course Notes
Lecture notes will be posted on the iLearn page.

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
- Grade Appeal Policy
- Complaint Management 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

https://unitguides.mq.edu.au/unit_offerings/149251/unit_guide/print 8
Student Support

Macquarie University provides a range of support services for students. For details, visit [http://students.mq.edu.au/support/](http://students.mq.edu.au/support/)

**Learning Skills**

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- Getting help with your assignment
- Workshops
- StudyWise
- 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**

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

**Student Enquiries**

For all student enquiries, visit Student Connect at [ask.mq.edu.au](http://ask.mq.edu.au)

If you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

**IT Help**

For help with University computer systems and technology, visit [http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/](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.

**Unit Schedule**

<table>
<thead>
<tr>
<th>WEEK</th>
<th>TOPIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Introduction to PDEs</td>
</tr>
<tr>
<td>Week 2</td>
<td>Method of Characteristics</td>
</tr>
<tr>
<td>Week 3</td>
<td>Method of Characteristics</td>
</tr>
<tr>
<td>Week 4</td>
<td>Linear Second-Order PDEs</td>
</tr>
</tbody>
</table>
WEEK | TOPIC
--- | ---
Week 5 | Similarity Solutions
Week 6 | Fourier Series
Week 7 | Separation of Variables
Week 8 | Separation of Variables
Week 9 | Fourier Transforms
Week 10 | Fourier Transforms
Week 11 | Green's Functions
Week 12 | Green's Functions
Week 13 | Wrap-up + Revision

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 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.