School of Information and Physical Sciences

MATH3700: Partial Differential Equations

Callaghan
Semester 2 - 2025

COURSE OUTLINE

OVERVIEW

Course Description

Partial differential equations arise from the mathematical modelling of a wide range of problems in biology, engineering, physical sciences, economics and finance. Therefore, they form an essential part of the mathematical background required for engineering and physical sciences. This course introduces students to the modern theory and methods of partial differential equations. It provides the students with the skills to formulate partial differential equations for modelling real-world problems, the knowledge to solve them using fundamental analytical and numerical methods, and the ability to interpret the results in the relation to the modelling context.

Academic Progress Requirements

Nil

Assumed Knowledge

MATH2310

Contact Hours

Callaghan
Lecture
Face to Face On Campus
3 hour(s) per week(s) for 13 week(s) starting Week 1
Tutorial and computer lab work will be integrated with lecture material as required.

Unit Weighting Workload

10
Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

CONTACTS

Course Coordinator

Callaghan
Dr Bishnu Lamichhane
Bishnu.Lamichhane@newcastle.edu.au
(61-2) 49215529
Consultation: By appointment

Teaching Staff

Other teaching staff will be advised on the course Canvas site.

School Office

School of Information and Physical Sciences
SR233, Social Sciences Building
Callaghan
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+61 2 4921 5538
9am-5pm (Mon-Fri)

SYLLABUS

Course Content

- Modelling with partial differential equations.
- Classical solution techniques: method of characteristics, separation of variables and Fourier series, transform methods.
- Numerical methods for partial differential equations: consistency, stability and convergence.

Course Learning Outcomes

On successful completion of this course, students will be able to:

1. Build mathematical models of relevant real-world problems based on partial differential equations in studying differential equations.

2. Classify second order partial differential equations, apply analytical methods to solve them, and physically interpret the solutions.

3. Apply numerical methods to solve practical partial differential equations and implement them in computers.

4. Interpret and communicate solutions in relation to the underlying modelling problem.

5. Analyse the consistency, stability and convergence properties of numerical methods.

Course Materials

Lecture Materials:

- Lecture materials will be posted on Canvas

Recommended Reading:

- M.P. Coleman. An Introduction to Partial Differential Equations with MATLAB, Chapman & Hall, second edition, 2016

- K.W. Morton and D.F. Mayer. Numerical solution of partial differential equation: An introduction, Cambridge University Press, second edition, 2005

- L.C. Evans. Partial differential equations, volume 19 of Graduate Studies in Mathematics. American Mathematical Society, Providence, RI, second edition, 2010.

SCHEDULE

ASSESSMENTS

This course has 3 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Quiz	Week 5 and Week 10 on Tuesday Lectures	Individual	25%	2, 3, 4, 5
2	Assignments	Week 6 and Week 11 on Monday Lectures.	Individual	25%	1, 2, 3, 4, 5
3	End of Semester Exam	Examination period	Individual	50%	2, 3, 4, 5

Late Submissions The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by up to 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assessment 1 - Quiz

Assessment Type Quiz
Purpose To provide students with feedback on student learning.
Description Two 50-minutes quizzes of written questions.
Weighting 25%
Length 50 minutes
Due Date Week 5 and Week 10 on Tuesday Lectures
Submission Method In Class
Assessment Criteria Mathematical correctness and clarity of presentation
Return Method In Class
Feedback Provided In Class - Two academic weeks after the quiz date.
Opportunity to Reattempt Students will not be given the opportunity to reattempt this assessment.

Assessment 2 - Assignments

Assessment Type Written Assignment
Purpose Written Assignments meet the course objectives of knowledge acquisition to demonstrate assimilation of data.
Description An articulate and concise document which conveys evidence-based understanding of the concepts and topics. There are two written assignments. The first one will be available in Week 4 and the second one will be available in Week 9.
Weighting 25%
Due Date Week 6 and Week 11 on Monday Lectures.
Submission Method In Class
Assessment Criteria Mathematical correctness and quality of presentation.
Return Method In Class
Feedback Provided In Class - Two weeks after submission.
Opportunity to Reattempt Students will not be given the opportunity to reattempt this assessment.

Assessment 3 - End of Semester Exam

Assessment Type	Formal Examination
Purpose	To test the individual student's knowledge of the course and their ability to describe, analyse and hypothesise from this material.
Description	Formal examination
Weighting	50%
Length	120 minutes
Due Date	Examination period
Submission Method	Formal Exam
Assessment Criteria	Mathematical correctness and clarity of presentation
Return Method	Not Returned
Feedback Provided	No Feedback - .
Opportunity to Reattempt	Students will not be given the opportunity to reattempt this assessment.

ADDITIONAL INFORMATION

Grading Scheme

This course is graded as follows:

Range of Marks	Grade	Description
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.
65-74	Credit (C)	Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail (FF)	Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.

*Skills are those identified for the purposes of assessment task(s).

Communication Methods

Communication methods used in this course include:

- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.
- Email: Students will receive communications via their student email account.
- Face to Face: Communication will be provided via face to face meetings or supervision.

Course Evaluation

Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.

Learning Analytics

The University uses an evidence-based approach to enhancing student learning and delivering support. Our careful analysis of data through learning analytics informs decision making processes related to student learning, academic outcomes, and support services. Learning analytics may be used to identify targeted individual opportunities for additional support services or interventions.

Interviews on Assessment Items

An Interview may be conducted on any assessment item in this course, in accordance with the Interview on Assessment Items Procedure. The purpose of the interview is to verify the author of the material submitted in response to the assessment task and provide a quality assurance measure.

In the event the Course Coordinator is not satisfied that a student's oral responses are consistent with the work originally submitted, the matter will be referred to the Student Academic Conduct Officer, who will take appropriate action under the Student Conduct Rule.

Academic Integrity and Ethical Academic Conduct Policy

All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations.

Please refer to the Academic Integrity and Ethical Academic Conduct Policy

Adverse Circumstances

The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s).

Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where:

1. the assessment item is a major assessment item; or
2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;
3. you are requesting a change of placement; or
4. the course has a compulsory attendance requirement.

Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure.

Use of generative artificial intelligence in course assessments

It is critical that any work submitted for assessment is your own original work. Before using generative AI tools (such as ChatGPT, Perplexity, Microsoft Copilot, etc) in any assessable work you must ensure that such use is in line with the requirements for the course and expectations of your Course Coordinator

Misuse of AI tools may be considered a breach of the University's Student Conduct Rule and could result in disciplinary action.

Artificial Intelligence detection software may be used to review any work you submit. If you have used AI in any way other than has been expressly permitted by your course coordinator, you may be engaging in academic misconduct and be subject to penalties.

For information, refer to:

- Generative AI Tools
- Academic Integrity

Important Policy Information

The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures that support a safe and respectful environment at the University

This course outline was approved by the Head of School. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.