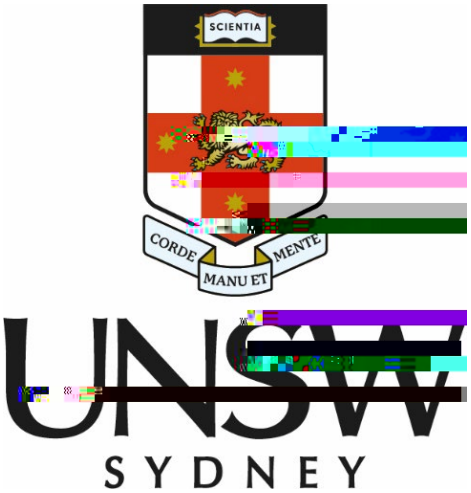

UNSW SCIENCE

School of Maths and Statistics

Course outline

MATH3121

Mathematical Methods and Partial Differential Equations

Term 1, 202

Cricos Provider Code: 00098G

Staff

Position	Name	Email	Room
Lecturer-in-charge	Dr Christopher Angstmann	c.angstmann@unsw.edu.au	RC-4076

Please refer to your Timetable on MyUNSW for your Lecture Tut, Lab enrolment days and times. Timetable weblink: http://timetable.unsw.edu.au/2023/MATH3121.html

Administrative Contacts

Please visit the School of Mathematics and Statistics website for a range of information on School Policies, Forms and Help for Students.

For information on Courses, please go to “Current Students” and either Undergraduate and/or Postgraduate”, Course Homepage” for information on all course offerings,

The “Student Notice Board” can be located by going to the “Current Students” page; Notices are posted regularly for your information here. Please familiarise yourself with the information found in these locations. The School web page is: https://www.maths.unsw.edu.au

If you cannot find the answer to your queries on the web you are welcome to contact the Student Services Office directly.

By email undergraduate

Course Aims

this course aims to introduce you to a range of techniques and theory that will be useful in solving partial differential equations (PDEs). Such equations are of significance due to their use in modelling phenomena from science, engineering and technology.

Course D escri ption

This course builds on MATH2120 Mathematical Methods for Differential Equations in that it is concerned with ways of solving the (usually partial) differential equations that arise mainly in physical, biological and engineering applications.

Analytical methods have considerable intrinsic interest, but their importance for applications is the driving motive behind this course. The main analytical tools developed in this course can be thought of as generalisations of the Fourier and power series representations of functions studied in MATH2120. This leads to new types of functions and to practical methods for solving differential equations. We will pay special attention to functions defined on infinite domains.

The course begins by characterising different partial differential equations (PDEs), and exploring similarity solutions and the method of characteristics to solve them. The Fourier transform, the natural extension of a Fourier series expansion is then investigated. For functions of time, the Fourier transform corresponds to the “spectrum” of the function or signal in the problem in the frequency domain. Closely related to the Fourier transform is the Laplace transform which is particularly useful for solving the initial value PDEs that arise in many physical applications. Although contour integration is an intrinsic part of using these transforms, only brief references to complex variable methods will be made.

Transforms give a wide insight into the behaviour of a function and suggests other possibilities for the integral representation of solutions of PDEs. By exploiting certain special solutions of a given linear PDE we eventually obtain the idea of a Green's function for the PDE and a corresponding integral form for the solution. The power of Green's functions can be observed in their use as the inverses of differential operators on both infinite and bounded domains.
Frequently it is not possible to evaluate in closed form the Fourier, Laplace or Green’s function integrals appearing in the solution of the given PDE. All is not lost as we can still explore the asymptotic behaviour of these integrals at large parameter values and obtain physically useful information on the solution of the underlying problem.

Assessment and Deadlines

Assessment	Week	Weighting %	Due date if applicable
Assignment 1	Week 3	10%	) U L G5pm\
, QClass Test	Week 5	20%	7 X HGVD1\ am
Assignment 2	Week 8	[redacted]	) U L G5pm\
Final Exa			

Weeks	Topic	Reading (if applicable)
1	Introduction and Revision	Refer to Moodle Lecture notes
2	Symmetries and Similarity Solutions	
3	The Method of Characteristics	
4	The Sturm-Liouville Equations	
5	Generalised Fourier series and their applications to PDEs	
7	Laplace Transforms	
8	Fourier Transforms	
9	Green's Functions	
10	Asymptotic methods for integrals	

Moodle

Log in to Moodle to find announcements, general information, notes, lecture slide, classroom tutorial and assessments etc.

https://moodle.telt.unsw.edu.au

School and UNSW Policies

The School of Mathematics and Statistics has adopted a number of policies relating to enrolment, attendance, assessment, plagiarism, cheating, special consideration etc. These are in addition to the Policies of The University of New South Wales. Individual courses may also adopt other policies in addition to or replacing some of the School ones. These will be clearly notified in the Course Initial Handout and on the Course Home Pages on the Maths Stats web site.

Students in courses run by the School of Mathematics and SSandn heinun

The UNSW Student Code provides a framework for the standard of conduct expected of UNSW students with respect to their academic integrity and behaviour. It outlines the primary obligations of students and directs staff and students to the Code and related procedures.

In addition, it is important that students understand that it is not permissible to buy essay/writing services from third parties as the use of such services constitutes plagiarism because it involves using the words or ideas of others and passing them off as your own. Nor is it permissible to sell copies of lecture or tutorial notes as students do not own the rights to this intellectual property.

If a student breaches the Student Code with respect to academic integrity, the University may take disciplinary action under the Student Misconduct Procedure.

The UNSW Student Code and the Student Misconduct Procedure can be found at: https://student.unsw.edu.au/plagiarism

An online Module "Working with Academic Integrity" (https://student.unsw.edu.au/aim) is a six-lesson interactive self-paced Moodle module exploring and explaining all of these terms and placing them into your learning context. It will be the best one-hour investment you've ever made.

Plagiarism

Plagiarism is presenting another person's work or ideas as your own. Plagiarism is a serious breach of ethics at UNSW and is not taken lightly. So how do you avoid it? A one-minute video for an overview of how you can avoid plagiarism can be found https://student.unsw.edu.au/plagiarism. .

The ELISE training webpages:

https://subjectguides.library.unsw.edu.au/elise/aboutelise

Equitable Learning Services (ELS)

If you suffer from a chronic or ongoing illness that has, or is likely to, put you at a serious disadvantage, then you should contact the Equitable Learning Services (previously known as SEADU) who provide confidential support and advice.

They assist students:

- living with disabilities
- with long- or short-term health concerns and/or mental health issues

The School will contact you (via student email account) after special consideration has been granted to reschedule your missed assessment, for a lab test or paper-based test only.

For applications for special consideration for