



UNSW SCIENCE
School of Maths and Statistics

Course outline

MATH3101/MATH5305

Computational Mathematics for Science
and Engineering

Term 3, 2022

Staff

Position	Name	Email	Room
Lecturer-in-charge	Associate Professor William McLean	w.mclean@unsw.edu.au	RC-2085

Please refer to your Timetable on MyUNSW for your Lecture Tut, Lab enrolment days and times.

Timetable weblink:

MATH3101: <https://timetable.unsw.edu.au/2022/MATH3101.html#S3S>

MATH5305: <https://timetable.unsw.edu.au/2022/MATH5305.html#S3>

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 “Student Life & resources page” and either Undergraduate Courses and/or Postgraduate Courses for information on all course offerings.

The “Student Notice Board” can be located by going to the “Student Life & resources” 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 ug.mathsstats@unsw.edu.au

By phone: 9385 7053

Should we need to contact you, we will use your official UNSW email address of in the first instance. It is your responsibility to regularly check your university email account. Please state your student number in all emails.

Course Information

Assumed knowledge / Pre-Requisite : Prerequisite: 12 units of credit in Level 2 Math courses including (MATH2011 or MATH2111 and MATH2120 or MATH2130 or MATH2121 or MATH2221), or (both MATH2019 (DN) and MATH2089), or (both MATH2069 (CR) and MATH2099)

Exclusions: MATH3301, MATH5305

We are aware some course exclusions on the Handbook may be different to the School website. We are in the process of updating this information. Meanwhile, students should be following the Handbook course information with the School website information as a supplement.

Course Aims

MATH3101/5305 is designed to provide students with a solid mathematical foundation for employment or further study in a wide range of scientific and engineering fields that rely on numerical modelling based on partial differential equations. The practical component of the course provides students with the opportunity to develop their programming skills.

Course Description

Partial differential equations (PDEs) provide a natural mathematical description for many phenomena of interest in science and engineering. Such equations are often difficult or impossible to solve using purely analytical (pencil and paper) methods, especially for realistic industrial problems. This course introduces finite difference and finite element methods for elliptic and parabolic PDEs, and discusses key concepts such as stability, convergence and computational cost. Relevant techniques in numerical linear algebra are also discussed.

The course includes a substantial practical component dealing with the computer implementation of the algorithms used for solving partial differential equations.

Note: Students must have some prior experience with simple computer programming.

Assessment and Deadlines

Assessment	Week	Weighting %
Class Test	4	20%
Computing Test	8	15%
Assignment	10	15%
Final Exam	Exam Period	50%

Late Submission of Assessment Tasks

A late penalty of 5% of the maximum mark for the task will be applied per day or part day any assessment task is submitted more than 1 hour late. (Where "late" in this context means 3 (c)-2 w -24.217 -1.315 T exten3 (c)-ion3 (c)-2granted for Spec (c)-ial Con3 (c)-ideration omg Pab3 (c)-le3 (c)-. Example, an assessment task that w.217 -1.3 (c)-2awarded 75% would be given as 5% if day3 (c)-2late. Any assessment task

Note that the penalty does not apply to

- Assessment tasks worth less than 5% of the total course mark, e.g. weekly quizzes, weekly class participation, or weekly homework tasks.
- Examinations and examination-style class tests
- Pass/Fail Assessments

Course Learning Outcomes (CLO)

- CLO1 Formulate a finite difference approximation to a partial differential equation.
- CLO2 Derive the weak form of an elliptic boundary-value problem and hence formulate an appropriate finite element method to compute an approximate solution.
- CLO3 Employ Taylor expansions to estimate the local truncation error and the order of consistency of a finite difference scheme.
- CLO4 Determine when a scheme is stable.
- CLO5 Exploit sparsity and other matrix structure to solve a system of linear equations efficiently.

Course Schedule

The course will include material taken from some of the following topics. This is should only serve as a guide as it is not an extensive list of the material to be covered and the timings are approximate. The course content is ultimately defined by the material covered in lectures.

Weeks	Topic	Reading (if applicable)
1		

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 Statistics should be aware of the School and Course policies by reading the appropriate pages on the Maths Stats web site <http://www.maths.unsw.edu.au>

Plagiarism

Plagiarism is presenting another person's work or ideas as your own. Plagiarism is a serious

Equitable Learning Services (ELS) may determine that your condition requires special arrangements for assessment tasks. Once the School has been notified of these, we will make every effort to meet the arrangements specified by ELS.

Additionally, if you have suffered significant misadventure that affects your ability to complete the course, please contact your Lecturer-in-charge in the first instance.

Academic Skills Support and the Learning Centre

The Learning Centre offers academic support programs to all students at UNSW Australia. We assist students to develop approaches to learning that will enable them to succeed in their academic study. For further information on these programs please go to:

<http://www.lc.unsw.edu.au/services-programs>

Applications for Special Consideration for Missed Assessment

Please adhere to the Special Consideration Policy and Procedures provided on the web page below when applying for special consideration.

<https://student.unsw.edu.au/special-consideration>

Please note that the application is not considered by the Course Authority, it is considered by a centralised team of staff at the Nucleus Student Hub.

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 *assignment extensions*, please note that the new submission date and/or outcome will be communicated through the special consideration web site only, no communication will be received from the School.

For Dates on Final Term Exams and Supplementary Exams please check the “Key Dates for Exams” ahead of time to avoid booking holidays or work obligations.

<https://student.unsw.edu.au/exam-dates>

If you believe your application for Special Consideration has not been processed, you should