UNSW Course Outline

MATH2301 Mathematical Computing - 2024

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General Course Information

Course Code : MATH2301
Year : 2024
Term : Term 1
Teaching Period : T1
Is a multi-term course? : No
Faculty : Faculty of Science
Academic Unit : School of Mathematics & Statistics
Delivery Mode : Multimodal
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

This is an introductory level course in computational mathematics for students from all disciplines. The course has both a laboratory and theoretical component. Topics covered include Introduction to Matlab and Python, floating point arithmetic, difference equations, nonlinear

equations, numerical differentiation and integration, initial value problems. The course provides a foundation for mathematical modelling and simulation.

Course Aims

The aim of this course is to introduce to students from any discipline the use of computers and numerical methods for mathematical modeling and simulation that may be useful in their future professions. The course features some key computer algorithms used in computational mathematics.

Relationship to Other Courses

- MATH2089 Numerical Methods and Statistics (numerical methods part) shared some materials with this course.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Use basic MATLAB or Python conventions and commands, including loops, conditional statements and functions.
CLO2 : Solve problems involving floating point arithmetic and understand its problems.
CLO3 : Use MATLAB to solve a variety of numerical problems such as interpolation, linear and non-linear equations, quadrature and solving ordinary differential equations.
CLO4 : Collaborate effectively to solve mathematical computing problems.

Course Learning Outcomes	Assessment Item
CLO1 : Use basic MATLAB or Python conventions and commands, including loops, conditional statements and functions.	• Final Exam • Group Project • Laboratory
CLO2 : Solve problems involving floating point arithmetic and understand its problems.	• Online Test • Final Exam • Laboratory
CLO3 : Use MATLAB to solve a variety of numerical problems such as interpolation, linear and non-linear equations, quadrature and solving ordinary differential equations.	• Group Project • Online Test • Final Exam • Laboratory
CLO4 : Collaborate effectively to solve mathematical computing problems.	• Group Project

Learning and Teaching Technologies

Moodle - Learning Management System

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Final Exam Assessment Format: Individual	50%	Start Date: during the exam period Due Date: Not Applicable
Group Project Assessment Format: Group	20%	Start Date: 18/03/2024 12:00 AM Due Date: 18/04/2024 01:00 PM
Online Test Assessment Format: Individual	15%	Start Date: 15/03/2024 03:00 PM Due Date: Not Applicable
Laboratory Assessment Format: Individual	15%	Start Date: Weeks 4, 9 short assigments; Week 8 long assignment Due Date: Not Applicable

Assessment Details

Final Exam

Assessment Overview

The final exam is designed to assess your learning and problem-solving skills on all topics delivered across all weeks of the term, including material from lectures, tutorials and laboratory classes. The exam is typically 2 hours long and consists of short numerical and short answers on the mathematical algorithms and theories presented in the course. The examination will occur during the official university examination period. Feedback is available through inquiry with the course convenor.

Course Learning Outcomes

- CLO1 : Use basic MATLAB or Python conventions and commands, including loops, conditional statements and functions.
- CLO2 : Solve problems involving floating point arithmetic and understand its problems.
- CLO3 : Use MATLAB to solve a variety of numerical problems such as interpolation, linear and non-linear equations, quadrature and solving ordinary differential equations.

Assessment Length

2 hours

Group Project

Assessment Overview

The group project is a major assessment on programming skills and incorporates almost all numerical algorithms presented in the lectures while requiring students to develop project management and science communication skills. You will be assigned to teams of 3-4 students. The project description will be released in week 5 and to be completed in week 10.

Group elements: 1. Project Report: (10%) Each group is expected to submit a project report which shows the results of the tasks of the project. The report must contain a short diary describing how the project was done collaboratively.
2. Computer source code (in MATLAB or Python): (8%) Each group is expected to submit the computer code that produced the outputs presented in the report.
3. Presentation: (2%) A 5-minute presentation is given by a member of each group in the lab of week 10. Other members will be asked questions related to the project.

Course Learning Outcomes

- CLO1 : Use basic MATLAB or Python conventions and commands, including loops, conditional statements and functions.
- CLO3 : Use MATLAB to solve a variety of numerical problems such as interpolation, linear and non-linear equations, quadrature and solving ordinary differential equations.
- CLO4 : Collaborate effectively to solve mathematical computing problems.

Submission notes

Matlab/Python codes and the project report will be submitted via Moodle

Assessment information

Late submissions are not accepted in general. If a special consideration is approved via the UNSW Special Consideration portal then a late submission is accepted.

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Online Test

Assessment Overview

Class Test 1 is designed to assess your knowledge of topics covered in lectures in weeks 1-5 inclusively. The test will be held online, typically at the end of Week 5 with a limit of 50 minutes. You will be provided with feedback with comments and solutions within two weeks of

completing the task.

Course Learning Outcomes

- CLO2 : Solve problems involving floating point arithmetic and understand its problems.
- CLO3 : Use MATLAB to solve a variety of numerical problems such as interpolation, linear and non-linear equations, quadrature and solving ordinary differential equations.

Assessment Length

50 minutes

Submission notes

The online test will be on Mobius platform

Assignment submission Turnitin type

Not Applicable

Laboratory

Assessment Overview

The laboratory classes involve weekly sets programming problems to help develop your programming skills in MATLAB (or Python). Across the term, you will complete three assessments during these weekly classes - two short programming assignments (1.5% each) in Weeks 4 and 9 and a long programming assignment in Week 8 (for 12%).

Course Learning Outcomes

- CLO1 : Use basic MATLAB or Python conventions and commands, including loops, conditional statements and functions.
- CLO2 : Solve problems involving floating point arithmetic and understand its problems.
- CLO3 : Use MATLAB to solve a variety of numerical problems such as interpolation, linear and non-linear equations, quadrature and solving ordinary differential equations.

Detailed Assessment Description

Late submissions are not accepted in general. If a special consideration is approved via the UNSW Special Consideration portal then a late submission is accepted.

Submission notes

The questions will be done via Matlab Grader

General Assessment Information

Grading Basis

Standard

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 12 February - 18 February	Lecture	Matlab programming; IEEE standard 754
Week 2 : 19 February - 25 February	Lecture	Floating point arithmetic; Linear systems (vector and matrix norms, sensitivity analysis)
Week 3 : 26 February - 3 March	Lecture	Linear systems (LU factorization, Cholesky factorization); Interpolation
Week 4 : 4 March - 10 March	Lecture	Interpolation and least squares (Newton interpolation, interpolation errors, least squares)
Week 5 : 11 March - 17 March	Lecture	Nonlinear equations (Bisection, fixed point iterations, Newton's method)
	Assessment	Online test (via Mobius)
Week 6 : 18 March - 24 March	Reading	Flex Week: No Classes
Week 7 : 25 March - 31 March	Lecture	Quadrature (Newton-Cotes rules, Gaussian rules)
Week 8 : 1 April - 7 April	Lecture	Ordinary differential equations (Euler's method, Heun's method, Runge-Kutta methods)
	Assessment	Lab test (via Matlab Grader)
Week 9 : 8 April - 14 April	Lecture	Ordinary differential equations (multistep methods, stiff equations)
Week 10 : 15 April - 21 April	Lecture	Systems of ordinary differential equations. Review for final exam
	Project	Project reports are due in labs this week. Your presentations will be during lab times.

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Course Resources

Prescribed Resources

- Lecture notes and lecture slides are available for enrolled students on Moodle.

Recommended Resources

- R. Pratap, Getting Started with MATLAB, 7th edition, Oxford University Press, 2002.
- K. Sigmon and T. A. Davis, MATLAB Primer - 6th Edition, CRC Press, 2001.
- D. Hanselman and B. Littlefield, Mastering MATLAB - 6: A Comprehensive Tutorial and Reference, Prentice-Hall, 2001.
- D. J. Higham and N. J. Higham, MATLAB Guide, SIAM, 2000.
- C. Moler, Numerical Computing with MATLAB http://mathworks.com/moler
- P. Linz and R. Wang, Exploring Numerical Methods -- An Introduction to Scientific Computing Using MATLAB
- John V. Guttag, "Introduction to Computation and Programming Using Python, With Application to Understanding Data, 3rd Edition, MIT Press.

Additional Costs

Non applicable.

Course Evaluation and Development

Student feedback is very important to continual course improvement. This is demonstrated within the School of Mathematics and Statistics by the implementation of the UNSW online student survey *myExperience*, which allows students to evaluate their learning experiences in an anonymous way. *myExperience* survey reports are produced for each survey. They are released to staff after all student assessment results are finalised and released to students. Course convenor will use the feedback to make ongoing improvements to the course.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Lecturer	Quoc Le Gia		Anita B. Lawrence Centre - Room 2084	9385 7049	Monday-Friday	No	Yes

Other Useful Information

Academic Information

Upon your enrolment at UNSW, you share responsibility with us for maintaining a safe, harmonious and tolerant University environment.

You are required to:

- Comply with the University's conditions of enrolment.
- Act responsibly, ethically, safely and with integrity.
- Observe standards of equity and respect in dealing with every member of the UNSW community.
- Engage in lawful behaviour.
- Use and care for University resources in a responsible and appropriate manner.
- Maintain the University's reputation and good standing.

For more information, visit the UNSW Student Code of Conduct Website.

Academic Honesty and Plagarism

Referencing is a way of acknowledging the sources of information that you use to research your

assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.
Further information about referencing styles can be located at https://student.unsw.edu.au/referencing

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect, responsibility and courage. At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.
Further information about academic integrity, plagiarism and the use of AI in assessments can be located at:

- The Current Students site,
- The ELISE training site, and
- The Use of AI for assessments site.

The Student Conduct and Integrity Unit provides further resources to assist you to understand your conduct obligations as a student: https://student.unsw.edu.au/conduct

Submission of Assessment Tasks

Penalty for Late Submissions

UNSW has a standard late submission penalty of:

- 5% per day,
- for all assessments where a penalty applies,
- capped at five days (120 hours) from the assessment deadline, after which a student cannot submit an assessment, and
- no permitted variation.

Any variations to the above will be explicitly stated in the Course Outline for a given course or assessment task.

Students are expected to manage their time to meet deadlines and to request extensions as early as possible before the deadline.

Special Consideration

If circumstances prevent you from attending/completing an assessment task, you must officially apply for special consideration, usually within 3 days of the sitting date/due date. You can apply

by logging onto myUNSW and following the link in the My Student Profile Tab. Medical documentation or other documentation explaining your absence must be submitted with your application. Once your application has been assessed, you will be contacted via your student email address to be advised of the official outcome and any actions that need to be taken from there. For more information about special consideration, please visit: https://student.unsw.edu.au/special-consideration

Important note: UNSW has a "fit to sit/submit" rule, which means that if you sit an exam or submit a piece of assessment, you are declaring yourself fit to do so and cannot later apply for Special Consideration. This is to ensure that if you feel unwell or are faced with significant circumstances beyond your control that affect your ability to study, you do not sit an examination or submit an assessment that does not reflect your best performance. Instead, you should apply for Special Consideration as soon as you realise you are not well enough or are otherwise unable to sit or submit an assessment.

Faculty-specific Information

Additional support for students

- The Current Students Gateway
- Student Support
- Academic Skills and Support
- Student Wellbeing, Health and Safety
- Equitable Learning Services
- UNSW IT Service Centre
- Science EDI Student Initiatives, Offerings and Guidelines

School-specific Information

School of Mathematics and Statistics 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 web site starting at: The School of Mathematics and Statistics assessment policies

The School of Mathematics and Statistics will assume that all its students have read and understood the School policies on the above pages and any individual course policies on the Course Initial Handout and Course Home Page. Lack of knowledge about a policy will not be an excuse for failing to follow the procedure in it.

Special Consideration - Short Extension Policy

The School of Mathematics and Statistics has carefully reviewed its range of assignments and projects to determine their suitability for automatic short extensions as set out by the UNSW Short Extension Policy. Upon comprehensive examination of our course offerings that incorporate these types of assessments, we have concluded that our current deadline structures already accommodate the possibility of unexpected circumstances that may lead students to require additional days for submission. Consequently, the School of Mathematics and Statistics has decided to universally opt out of the Short Extension provision for all its courses, having pre-emptively integrated flexibility into our assessment deadlines. The decision is subject to revision in response to the introduction of new course offerings. Students may still apply for Special Consideration via the usual procedures.

Computing Lab

The main computing laboratory is room G012 of the Anita B.Lawrence Centre (formerly Red Centre). You can get to this lab by entering the building through the main entrance to the School of Mathematics (on the Mezzanine Level) and then going down the stairs to the Ground Level. A second smaller lab is Room M020, located on the mezzanine level through the glass door (and along the corridor) opposite the School's entrance.

For more information, including opening hours, see the computing facilities webpage. Remember that there will always be unscheduled periods when the computers are not working because of equipment problems and that this is not a valid excuse for not completing assessments on time.

School Contact Information

School Contact Information

Please visit the School of Mathematics and Statistics website for a range of information.

For information on Courses, please go to “Student life & resources” and either Undergraduate and/or Postgraduate and respective "Undergraduate courses" and "Postgraduate courses" for

information on all course offerings.

All school policies, forms and help for students can be located by going to the "Student Services" within “Student life & resources” page. We also post notices in "Student noticeboard" for your information. Please familiarise yourself with the information found in these locations. If you cannot find the answer to your queries on the web you are welcome to contact the Student Services Office directly.

Undergraduate

E: ug.mathsstats@unsw.edu.au

P: 9385 7011 or 9385 7053

Postgraduate

E: pg.mathsstats@unsw.edu.au

P: 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 use your UNSW student email and state your student number in all emails to us.**