UNSW Course Outline

ZPEM1301 Mathematics 1A - 2024

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General Course Information

Course Code : ZPEM1301
Year : 2024
Term : Semester 1
Teaching Period : Z1
Is a multi-term course? : No
Faculty : UNSW Canberra
Academic Unit : UC Science
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : UNSW Canberra at ADFA
Campus : UNSW Canberra
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

ZPEM1301 is an introduction to the basics of Calculus and Linear Algebra. This course emphasizes understanding of mathematical concepts and developing an appreciation for mathematical thinking. The course is designed to provide students from diverse mathematical backgrounds with the appropriate foundations for further studies in Science and Mathematics.

The following topics are covered:

Calculus: concept of a function and limits, calculus of functions of a single variable, differentiation, optimisation, integration, and Taylor series;

Linear Algebra: geometrical description of vectors and their properties, problems leading to linear equations whose solution is facilitated by the development of matrix theory; applications of matrices to various problems such as workforce planning and population dynamics; the study of eigenvalue problems; introduction to complex numbers.

Course Aims

ZPEM1301 is an introduction to the basics of Calculus and Linear Algebra. This course emphasizes understanding of mathematical concepts and developing an appreciation for mathematical thinking. The course is designed to provide students from diverse mathematical backgrounds with the appropriate foundations for further studies in Science and Mathematics.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Represent functions numerically, graphically and algebraically, and be able to interpret them in applications. Understand the concept of a limit and be able to calculate limits algebraically. Calculate the Taylor series of a function and understand how it applies in applications.
CLO2 : Explain the meaning of the derivative, and calculate it algebraically from first principles; differentiate standard functions and interpret their derivatives in applications. Explain the meaning of the integral, and calculate it algebraically; Integrate standard functions and interpret their integral in applications.
CLO3 : Represent a linear system of equations, in terms of matrices, and use matrix properties to solve the equations including applied situations. Define and solve eigenvalue problems.
CLO4 : Understand the geometric and algebraic representations of vectors, and use vectors in a variety of applications including as a representation of complex numbers and the operations associated with them.

Course Learning Outcomes	Assessment Item
CLO1 : Represent functions numerically, graphically and algebraically, and be able to interpret them in applications. Understand the concept of a limit and be able to calculate limits algebraically. Calculate the Taylor series of a function and understand how it applies in applications.	• Class Test 1 • On-line Worksheets (x 12) • Exam
CLO2 : Explain the meaning of the derivative, and calculate it algebraically from first principles; differentiate standard functions and interpret their derivatives in applications. Explain the meaning of the integral, and calculate it algebraically; Integrate standard functions and interpret their integral in applications.	• Class Test 2 • On-line Worksheets (x 12) • Exam
CLO3 : Represent a linear system of equations, in terms of matrices, and use matrix properties to solve the equations including applied situations. Define and solve eigenvalue problems.	• Class Test 2 • On-line Worksheets (x 12) • Exam
CLO4 : Understand the geometric and algebraic representations of vectors, and use vectors in a variety of applications including as a representation of complex numbers and the operations associated with them.	• Class Test 1 • On-line Worksheets (x 12) • Exam

Learning and Teaching Technologies

Moodle - Learning Management System

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Class Test 1 Assessment Format: Individual	15%	
Class Test 2 Assessment Format: Individual	15%	
On-line Worksheets (x 12) Assessment Format: Individual	36%	
Exam Assessment Format: Individual	34%	

Assessment Details

Class Test 1

Assessment Overview

Class test covering the initial 4-6 weeks of lecture content and associated worksheets.

Course Learning Outcomes

- CLO1 : Represent functions numerically, graphically and algebraically, and be able to interpret them in applications. Understand the concept of a limit and be able to calculate limits algebraically. Calculate the Taylor series of a function and understand how it applies in applications.
- CLO4 : Understand the geometric and algebraic representations of vectors, and use vectors in a variety of applications including as a representation of complex numbers and the operations associated with them.

Class Test 2

Assessment Overview

Class test covering the final half of the course: lecture content and associated worksheets.

Course Learning Outcomes

- CLO2 : Explain the meaning of the derivative, and calculate it algebraically from first principles; differentiate standard functions and interpret their derivatives in applications. Explain the meaning of the integral, and calculate it algebraically; Integrate standard functions and interpret their integral in applications.
- CLO3 : Represent a linear system of equations, in terms of matrices, and use matrix properties to solve the equations including applied situations. Define and solve eigenvalue problems.

On-line Worksheets (x 12)

Assessment Overview

Worksheets on the current lecture content completed on-line via the Moodle. Feedback is immediate. Each worksheet is only likely to meet one learning outcome but the assessment class as a whole should cover content from the entirety of the course.

Course Learning Outcomes

- CLO1 : Represent functions numerically, graphically and algebraically, and be able to interpret them in applications. Understand the concept of a limit and be able to calculate limits algebraically. Calculate the Taylor series of a function and understand how it applies in applications.
- CLO2 : Explain the meaning of the derivative, and calculate it algebraically from first principles; differentiate standard functions and interpret their derivatives in applications. Explain the meaning of the integral, and calculate it algebraically; Integrate standard functions and interpret their integral in applications.
- CLO3 : Represent a linear system of equations, in terms of matrices, and use matrix properties to solve the equations including applied situations. Define and solve eigenvalue problems.
- CLO4 : Understand the geometric and algebraic representations of vectors, and use vectors in a variety of applications including as a representation of complex numbers and the operations associated with them.

Exam

Assessment Overview

Capstone assessment item.

Course Learning Outcomes

- CLO1 : Represent functions numerically, graphically and algebraically, and be able to interpret them in applications. Understand the concept of a limit and be able to calculate limits algebraically. Calculate the Taylor series of a function and understand how it applies in applications.
- CLO2 : Explain the meaning of the derivative, and calculate it algebraically from first principles; differentiate standard functions and interpret their derivatives in applications. Explain the meaning of the integral, and calculate it algebraically; Integrate standard functions and interpret their integral in applications.
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General Assessment Information

Use of AI in assessment:

NO ASSISTANCE

It is prohibited to use any software or service to search for or generate information or answers. If its use is detected, it will be regarded as serious academic misconduct and subject to the standard penalties, which may include 00FL, suspension and exclusion.

Grading Basis

Standard

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 26 February - 1 March	Lecture	• Linear Algebra Lecture 1 - Introduction Lecture 2 - Linear Systems I • Calculus Introduction to functions
Week 2 : 4 March - 8 March	Lecture	• Linear Algebra Lecture 3 - Linear Systems II Lecture 4 - Linear Systems III • Calculus Introduction to functions
Week 3 : 11 March - 15 March	Lecture	• Linear Algebra Canberra Day -- Monday, 11 March Lecture 5 - Vectors I • Calculus Elementary functions
Week 4 : 18 March - 22 March	Lecture	• Linear Algebra Lecture 6 - Vectors II Lecture 7 - Vectors III • Calculus Inverse Functions I
Week 5 : 25 March - 29 March	Lecture	• Linear Algebra Lecture 8 - Vectors IV Lecture 9 - Vectors V • Calculus Lecture 8 - Inverse Function II Good Friday, 29 March
Week 6 : 1 April - 5 April	Lecture	• Linear Algebra Easter Monday, 1 April Lecture 10 - Lines • Calculus Lectures 9 and 10 - Introduction to Differentation
Week 7 : 22 April - 26 April	Lecture	• Linear Algebra Lecture 11 - TBA Military Training Day, 24 April • Calculus ANZAC Day, 25 April Lecture 11 - TBA
Week 8 : 29 April - 3 May	Lecture	• Linear Algebra Lecture 12 - Planes Class Test 1, 1 May • Calculus Lecture 12 - Linearity of Differentiation Class Test 2, 3 May
	Assessment	Class Test 2 May 3 at 1100-1150
Week 9 : 6 May - 10 May	Lecture	• Linear Algebra Lecture 13 - Linear Independence Lecture 14 - Matrices I • Calculus Lecture 13 - Properties of the derivative Military Training Day, 10 May
Week 10 : 13 May - 17 May	Lecture	• Linear Algebra Lecture 15 - Matrices II Lecture 16 - Matrices III • Calculus Lecture 14 - Extremal Problems Lecture 15 - Introduction to Integration
Week 11 : 20 May - 24 May	Lecture	• Linear Algebra Lecture 17 - Determinants Lecture 18 - Eigenproblems I • Calculus Lecture 16 - Riemann Sums Lecture 17 - Integration Properties
Week 12 : 27 May - 31 May	Lecture	• Linear Algebra Lecture 19 - Elgenproblems II Note: Monday timetable on Tuesday 28 May Lecture 20 - Complex Numbers I • Calculus Lecture 18 - Integration techniques I Lecture 19 - Integration techniques II
Week 13 : 3 June - 7 June	Lecture	• Linear Algebra Lecture 21 - Complex Numbers II Lecture 22 - Complex Numbers III • Calculus Lecture 20 - Integration techniques III Lecture 21 - Integration techniques IV

Attendance Requirements

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

General Schedule Information

There are two components of ZPEM1301 Engineering Mathematics 1A:

- Linear Algebra -- delivered on Tuesdays & Wednesdays
- Calculus -- delivered on Thursdays & Fridays

Students have a single tutorial per week.

Course Resources

Prescribed Resources

We are using the open textbook *"Matrix Theory & Linear Algebra"* by Peter Selinger for the linear algebra component of ZPEM1303. A PDF of the text is available on the course Moodle page.

From this text we will work through the material presented in:

- *Systems of linear equations,* Chapter 1, sections 1-8
- *Vectors, Lines & Planes* , Chapter 2 & 3
- *Matrices,* Chapter 4, sections 1-7
- *Linear Independence,* Chapter 5, sections 1-2
- *Determinants, Eigenproblems*, Chapter 7 & 8
- *Complex number*, Appendix A

Additional notes will be made available on Moodle as required.

Course notes for calculus are available on Moodle.

Recommended Resources

- Barry, S & Davis, S, Essential Mathematical Skills, 2nd edition, UNSW Press.
- Stuart's “Calculus”: any edition will do. This can be obtained in print, from the library, or online.

Additional Costs

Nil.

Course Evaluation and Development

One of the key priorities in the 2025 Strategy for UNSW is a drive for academic excellence in education. One of the ways of determining how well UNSW is progressing towards this goal is by
listening to our own students. Students will be asked to complete the myExperience survey towards the end of this course.

Students can also provide feedback during the semester via: direct contact with the lecturer, the “On-going Student Feedback” link in Moodle, Student-Staff Liaison Committee meetings in schools, informal feedback conducted by staff, and focus groups. Student opinions really do make a difference. Refer to the Moodle site for this course to see how the feedback from previous students has contributed to the course development

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Tim Trudgian					No	Yes
Lecturer	Isaac Towers					No	No

Other Useful Information

Academic Information

Course Evaluation and Development

One of the key priorities in the 2025 Strategy for UNSW is a drive for academic excellence in education. One of the ways of determining how well UNSW is progressing towards this goal is by listening to our own students. Students will be asked to complete the myExperience survey towards the end of each course.

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Important note: Students are reminded that any feedback provided should be constructive and professional and that they are bound by the Student Code of Conduct.

https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf

Equitable Learning Services (ELS)

Students living with neurodivergent, physical and/or mental health conditions or caring for someone with these conditions may be eligible for support through the Equitible Learning

Services team. Equitable Learning Services is a free and confidential service that provides practical support to ensure your mental or physical health conditions do not adversely affect your studies.

Our team of dedicated **Equitable Learning Facilitators** (ELFs) are here to assist you through this process. We offer a number of services to make your education at UNSW easier and more equitable.

Further information about ELS for currently enrolled students can be found at: https://www.student.unsw.edu.au/equitable-learning

Academic Honesty and Plagarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW staff and students have a responsibility to adhere to this principle of academic integrity. All students are expected to adhere to UNSW's Student Code of Conduct. Find relevant information at: Student Code of Conduct (unsw.edu.au)

Plagiarism undermines academic integrity and is not tolerated at UNSW. It is defined as using the words or ideas of others and passing them off as your own, and can take many forms, from deliberate cheating to accidental copying from a source without acknowledgement.

For more information, please refer to the following:

https://student.unsw.edu.au/plagiarism

Submission of Assessment Tasks

Special Consideration

Special Consideration is the process for assessing and addressing the impact on students of short-term events, that are beyond the control of the student, and that affect performance in a specific assessment task or tasks.

Applications for Special Consideration will be accepted in the following circumstances only:

- Where academic work has been hampered to a substantial degree by illness or other cause;
- The circumstances are unexpected and beyond the student's control;
- The circumstances could not have reasonably been anticipated, avoided or guarded against by the student; and either:

(i) they occurred during a critical study period and was 3 consecutive days or more duration, or a total of 5 days within the critical study period; or

(ii) they prevented the ability to complete, attend or submit an assessment task for a specific date (e.g. final exam, in class test/quiz, in class presentation)

Applications for Special Consideration must be made as soon as practicable after the problem occurs and at the latest within three working days of the assessment or the period covered by the supporting documentation.

By sitting or submitting the assessment task the student is declaring that they are fit to do so and cannot later apply for Special Consideration (UNSW 'fit to sit or submit' requirement).

Sitting, accessing or submitting an assessment task on the scheduled assessment date, after applying for special consideration, renders the special consideration application void.

Find more information about special consideration at: https://www.student.unsw.edu.au/special/consideration/guide

Or apply for special consideration through your MyUNSW portal.

Late Submission of assessment tasks (other than examinations)

UNSW has a standard late submission penalty of:

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

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

Electronic submission of assessment

Except where the nature of an assessment task precludes its electronic submission, all assessments must be submitted to an electronic repository, approved by UNSW or the Faculty, for archiving and subsequent marking and analysis.

Release of final mark

All marks obtained for assessment items during the session are provisional. The final mark as published by the university following the assessment review group meeting is the only official mark.