UNSW Course Outline

ZPEM1304 Engineering Mathematics 1B - 2024

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General Course Information

Course Code : ZPEM1304
Year : 2024
Term : Semester 2
Teaching Period : Z2
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

This course covers three topics. The first topic, Differential equations, considers methods of solving first-order, second-order and high-order differential equations, as well as modelling various applicable systems using differential equations. The second topic, Probability, considers

the fundamental laws of probability including continuous and discrete random variables, with applications to system reliability. The third topic, Multivariable Calculus, introduces the student to calculus in two dimensions such as gradients, line and double integrals and basic vector fields. There will be some use of computer packages such as MATLAB.

Course Aims

The aim of this course is to introduce students to; multivariable calculus (MVC), Probability and Linear Systems (LS).

Course Learning Outcomes

Course Learning Outcomes
CLO1 : analyse and solve problems in a logical and systematic manner using basic knowledge of differentiation and integration
CLO2 : solve ODEs graphically, numerically and using different algebraic methods
CLO3 : identify functions of several variables, surfaces of functions and surfaces which are not functions
CLO4 : solve problems involving partial derivatives and double integrals
CLO5 : solve life-related problems involving probability and probability distributions

Course Learning Outcomes	Assessment Item
CLO1 : analyse and solve problems in a logical and systematic manner using basic knowledge of differentiation and integration	• Quizzes (x4) • Class Tests (4) • Final Exam
CLO2 : solve ODEs graphically, numerically and using different algebraic methods	• Quizzes (x4) • Class Tests (4) • Final Exam
CLO3 : identify functions of several variables, surfaces of functions and surfaces which are not functions	• Quizzes (x4) • Class Tests (4) • Final Exam
CLO4 : solve problems involving partial derivatives and double integrals	• Quizzes (x4) • Class Tests (4) • Final Exam
CLO5 : solve life-related problems involving probability and probability distributions	• Quizzes (x4) • Class Tests (4) • Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System

Learning and Teaching in this course

Enrolment in this course or participation in any activity that is recorded constitutes consent to be recorded during tutorial and other teaching sessions. Recordings will only be used for the purposes of teaching this course. If you do not consent to be recorded, you must notify your course convenor immediately so other arrangements can be made.

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You will likely pass this course through completion of the problems in the course notes, in the textbook, and on problem sheets handed out during the course.

The material provided with this course is designed to provide feedback on students' progress. In particular:

1. The tutorial problems will provide the student with the opportunity to solve problems of greater complexity than those in lectures. Quizzes, class tests and the final exam will test the student's ability to solve problems using the skills and ideas learnt in the course.
2. The tutorial problems will require the student to understand and apply what they have learnt. Students will need to make decisions about which approach is relevant for a given problem and to examine their results critically.
3. Tutorial problems and assessment items will require students to explain the mathematical concepts and reasoning in their solutions to problems accurately and clearly.

During private study, the recommended strategy is to **actively seek out** where the topic is useful to your career (or life). For example, the law of conditional probability is used to estimate the probability of a system failure, which in turn may be used to estimate the risk of a military asset being destroyed by fire, and subsequently to mitigate that risk by designing a better fire suppression system. The next step is **to relate new ideas to previous knowledge**. For example, partial derivatives are an extension of the ordinary derivative that have previously been studied. Finally, the technique for solving problems **must be practiced**. For example, dedicating study time to solving many second-order linear ODEs from a textbook.

Study as much as you need to understand the material. As a very rough guideline the University recommends about **6–8 hours of work per week outside classes,** principally doing problems but your study requirements may vary.

Successful completion of this course contributes to the acquisition of UNSW graduate capabilities. UNSW aspires to develop globally focused graduates who are **rigorous scholars**, capable of **leadership** and **professional practice** in an **international** community.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Quizzes (x4) Assessment Format: Individual Short Extension: Yes (3 days)	10%	Start Date: Not Applicable Due Date: Not Applicable
Class Tests (4) Assessment Format: Individual	56%	Start Date: Not Applicable Due Date: Not Applicable
Final Exam Assessment Format: Individual	34%	

Assessment Details

Quizzes (x4)

Assessment Overview

Quizzes will consist of a few online questions working through a concept discussed in lectures. Feedback is immediate. Infinite attempts over the course of a week, 15 minute time limit to complete. Mark is the best the student achieves.

Course Learning Outcomes

- CLO1 : analyse and solve problems in a logical and systematic manner using basic knowledge of differentiation and integration
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- CLO5 : solve life-related problems involving probability and probability distributions

Detailed Assessment Description

Quizzes are intended to be formative assessment that will allow students to identify their strengths and weaknesses and allow students to make targeted improvements. Quizzes will be accessible online for 5 days.

Assessment Length

15 mins

Assignment submission Turnitin type

This is not a Turnitin assignment

Class Tests (4)

Assessment Overview

The content of the class tests is heavily influenced by the notes, lectures, and tutorials. Class tests will be held during the scheduled lecture periods. 50 minute closed book conditions.

Feedback will be provided with individual comments on moodle telling students where to improve. Some part of a subsequent lecture will be devoted to class-based feedback identifying common difficulties. Individual feedback will be provided during consultations.

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Assessment Length

50 mins

Assignment submission Turnitin type

Not Applicable

Final Exam

Assessment Overview

Standard closed book 3 hour final examination containing approximately 8 questions on all areas of the course, weighted appropriately (ie 50% ODES, 25% each MVC and Prob). Questions are similar to class test questions.

Class tests will be redeemable in the exam. This is also known as the better-mark scheme. As such, the final mark F is the produced by the following formula: F= 0.02 (Q1+Q2+Q3+Q4+Q5+Q6) + 0.14 (max(T1, E) + max(T2, E) + max(T3, E))+0.46 E ,

where Qi is the mark for the ith quiz, Ti is the mark for the ith test, and E is the exam mark. max(a,b) is the maximum function and returns a or b, whichever is larger. All marks are

expressed as a decimal; multiply by 100 to convert F to a percentage.

Feedback is only the final mark. Individual feedback can be provided if the student requests a consultation after the marks are released.

Course Learning Outcomes

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General Assessment Information

USE OF GENERATIVE AI: NO ASSISTANCE (This is most relevant for invigilated exams) 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

Requirements to pass course

The assessment for the course has been designed so that an overall mark of 50% or greater indicates that the student has demonstrated satisfactory performance.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 15 July - 19 July	Topic	Intro ODES
Week 2 : 22 July - 26 July	Topic	Modelling ODES
Week 3 : 29 July - 2 August	Topic	Linear 1st order ODES
Week 4 : 5 August - 9 August	Topic	2nd order ODES
Week 5 : 12 August - 16 August	Topic	2nd order ODES
Week 6 : 19 August - 23 August	Topic	Physical meaning of solutions
Week 7 : 9 September - 13 September	Topic	Intro to MVC
Week 8 : 16 September - 20 September	Topic	Partial Derivatives
Week 9 : 23 September - 27 September	Topic	Double integrals
Week 10 : 30 September - 4 October	Topic	Basic Probability
Week 11 : 7 October - 11 October	Topic	Distributions
Week 12 : 14 October - 18 October	Topic	Distributions
Week 13 : 21 October - 25 October	Topic	System Reliability

Attendance Requirements

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

Course Resources

Recommended Resources

Recommended Readings

Barry, S & Davis, S, *Essential Mathematical Skills*, 2nd edition, UNSW Press.

Hughes-Hallett, D et al, *Calculus Single and Multivariable*, 6th edition, Wiley (EM1A text).

Noonburg, V, *Ordinary Differential Equations: From Calculus to Dynamical Systems*, MAA Press.

Spiegel, M, *Mathematical Handbook*, Schaum Outline Series.

All course materials (notes, practice assessments, etc) will be available on Moodle.

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.

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 Policy*

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

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
	Duncan Sutherland					No	Yes