UNSW SCIENCE

School of Maths and Statistics

Course outline

MATH2069

Mathematics 2A

Term 3, 2022

Cricos Provider Code: 00098G

Staff

Position	Name	Email	Room
Lecturer-in-charge	A/Prof. Pinhas Grossman	p.grossman@unsw.edu.au	RC-6112a

Please refer to your Timetable on MyUNSW for your Lecture Tut, Lab enrolment days and times.
Timetable weblink: http://timetable.unsw.edu.au/2022/MATH2069.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 “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 Undergraduate ug.mathsstats@unsw.edu.au

By phone: 9385 7011 or 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 Aims

This course has two strands, Vector Calculus and Complex Analysis, both of which are important for engineering students. These topics bring together calculus and linear algebra and have many applications to physics, engineering and mathematics, and are particularly important for electrical engineers.

Vector Calculus deals with calculus in two and three dimensions, and develops the theory of curves, vector functions and partial derivatives, two and three dimensional integration, line

integrals and curl and divergence. [Applications include mechanics and dynamics, electrostatics, graphics and design.]

Complex Analysis extends calculus from real numbers to complex numbers, and develops the theory of analytic functions, complex integration and Cauchys theorem, series expansions, the residue theorem and applications to real improper integrals and trigonometric integrals. [Applications include fluid flow, electrostatics, circuit theory, and heat flow.]

Course Description

Several Variable Calculus:Vectors, differential calculus of curves in R3 and surfaces, Taylor series for functions of two variables, critical points, local maxima and minima. Lagrange multipliers, integral calculus for functions of several variables using various co-ordinate systems, conservative vector fields and line integrals, Green's Theorem in the plane, divergence and curl, surface integrals, Stokes' Theorem, Gauss' divergence Theorem.Complex Analysis:Complex numbers, simple mapping problems, differentiation theory for complex functions, Cauchy Riemann equations, analytic functions, the elementary functions, Integration Theory for complex functions, Cauchy's Theorem and the Cauchy integral formulae, Taylor series and Laurent Series, residues, evaluating real integrals and trigonometric integrals using residues. Note: Available only to students for whom it is specifically required as part of their program

Assessment and Deadlines

Assessment	Week	Weighting %	Notes
Weekly Quiz	Week 1-5	10	At the beginning of each week, an online quiz containing 4 questions (2 questions each for Vector Calculus and Complex Analysis) will be released. Students will have until the end of the following week to submit their answers and they can try their answers as many times as they want. The task will be worth 10% towards the final mark for Complex Analysis and Vector Calculus
Written Tests (These will be given online during the lecture hours)	Week 8	15	Complex Test
		15	Vector Test
Final Exam	Exam period	60	

Late Submission of Assessment Tasks

No late submissions will be accepted. (Where "late" in this context means after any extensions granted for Special Consideration or Equitable Learning Provisions.)

Course Learning Outcomes (CLO)

CLO1 Understand the differentiation theory for functions of several variables.

CLO2 Perform basic calculations relating to tangent planes, normal lines, directional deriviatives, curves and surfaces in three dimensional space, lagrange multipliers, location and classication of critical points

CLO3 Understand the basic theory of line and surface integrals and the theorems of Green, Stokes and Gauss.

CLO4 Perform basic calculations relating to line and surface integrals and apply the theorems of Green, Stokes and Gauss.

CLO5 Understand the basic integration theory for functions of several variables.

CLO6 Perform basic calculations relating to double and triple integrals in cartesian, polar and spherical coordinates.

CLO7 Understand the main properties and examples of analytic functions.

CLO8 Compute and manipulate series expansions for analytic functions.

CLO9 Know and be able to use the major integral theorems.

CLO10 Identify and classify zeroes and poles of functions and find their residues.

CLO11 Understand the relationship between complex function theory and the theory of functions of a real variable.

CLO12 Calculate certain real improper and trigonometric integrals using complex analytic methods.

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**
1	CA: Introduction: Revision, basic topology, functions and mappings. VC: Vectors, curves, and surfaces.
2	CA: Limits, continuity, differentiability. VC: Partial derivatives and continuity; Chain rule.
3	CA: Analytic and harmonic functions. Exponential, trigonometric and hyperbolic functions. VC: Gradient and directional derivatives; Normal vectors and tangent planes; Error estimates and critical points on surfaces.
4	CA: Principal logarithms and complex exponents. Introduction to complex integration. VC: Lagrange multipliers; Double integrals.

5	CA: Arcs, contour integrals and antiderivatives. Cauchy- Goursat theorem. Homotopy version of Cauchy-Goursat theorem. VC: Double integrals continued (including polar coordinates); Triple Integrals.
7	CA: The Cauchy integral formula. The generalised Cauchy integral formula. Taylor Series. VC: Triple integrals continued (including cylindrical and spherical coordinates)
8	CA: Laurent series. Zeroes and singularities. VC: Change of variables; Line integrals; Green's Theorem.
9	CA: The method of Residues. The Z-Transform. (The Z-transform will not be examinable this year.) VC: Surface integrals; Flux Integrals
10	CA: Real Improper integrals. Trigonometric integrals. Revision. VC: Divergence and curl; Stokes Theorem; Divergence Theorem

Textbooks

There is no set textbook for the course.

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 Statistics should be aware of the School and Course policies by reading the appropriate pages on the Maths Stats web site starting at:

https://www.maths.unsw.edu.au/currentstudents/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.

Academic Integrity and Plagiarism

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. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

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.

Additional Support

ELISE (Enabling Library and Information Skills for Everyone)

ELISE is designed to introduce new students to studying at UNSW.

Completing the ELISE tutorial and quiz will enable you to:

- analyse topics, plan responses and organise research for academic writing and other assessment tasks
- effectively and efficiently find appropriate information sources and evaluate relevance to your needs
- use and manage information effectively to accomplish a specific purpose
- better manage your time
- understand your rights and responsibilities as a student at UNSW
- be aware of plagiarism, copyright, UNSW Student Code of Conduct and Acceptable Use of UNSW ICT Resources Policy
- be aware of the standards of behaviour expected of everyone in the UNSW community
- locate services and information about UNSW and UNSW Library

Some of these areas will be familiar to you, others will be new. Gaining a solid understanding of all the related aspects of ELISE will help you make the most of your studies at UNSW.

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
- who are primary carers
- from low SES backgrounds
- of diverse genders, sexes and sexualities
- from refugee and refugee-like backgrounds
- from rural and remote backgrounds
- who are the first in their family to undertake a bachelor-level degree.

Their web site is: https://student.unsw.edu.au/els/services

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 email specialconsideration@unsw.edu.au immediately for advice.

Course Evaluation and Development (MyExperience)

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.