UNSW Course Outline

MATH2701 Abstract Algebra and Fundamental Analysis - 2024

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General Course Information

Course Code : MATH2701
Year : 2024
Term : Term 3
Teaching Period : T3
Is a multi-term course? : No
Faculty : Faculty of Science
Academic Unit : School of Mathematics & Statistics
Delivery Mode : In Person
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

Mathematics went through quite a revolution around the turn of the 20th century. In particular, an axiomatic approach infiltrated the mathematical paradigm, both as a tool to ensure mathematical rigour and to abstract common principles working in a variety of different settings.

First year mathematics emphasizes computation over abstraction and rigour. Later year courses (and Pure Mathematics in general) reverse this, so students need to learn some new skills and some new ways of thinking about mathematical objects.

The course consists of two halves, algebra and analysis, using lectures and tutorials for content delivery and investigation. The analysis part of the course begins with inequalities and how to bound quantities that cannot be calculated precisely. Many nice examples from geometry will be used to motivate discussions. Then the focus switches to aspects of the real numbers, such as how well one can approximate π by a rational p/q (in terms of how large q is).

The algebra half of the course looks at transformations on the plane and projective plane, studying maps such as translations, reflections, rotations in terms of groups. Topics include transformations of geometric figures that preserve some property (such as distance or angles between lines), and projective geometry. Projective transformations can change a conic section of one type to another, e.g. an ellipse to a hyperbola.

Course Aims

This course is designed to help students develop the ability to write rigorous mathematical proofs in a setting where the level of abstraction is still quite modest. As such it will serve as an excellent preparation for the third year Pure Mathematics courses.

Relationship to Other Courses

Prerequisite: MATH1231 or DPST1014 or MATH1241 or MATH1251 with at least a CR, enrolment in an advanced maths or advanced science program

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Describe the importance of groups in modern mathematics, particularly algebra and geometry through several important cases and their applications.
CLO2 : Use and manipulate several fundamental inequalities in diverse settings.
CLO3 : Communicate arguments in algebra and analysis clearly in written form using logical proofs.

Course Learning Outcomes	Assessment Item
CLO1 : Describe the importance of groups in modern mathematics, particularly algebra and geometry through several important cases and their applications.	• Final Exam • Algebra Assignments • Class Test
CLO2 : Use and manipulate several fundamental inequalities in diverse settings.	• Analysis Assignments • Final Exam
CLO3 : Communicate arguments in algebra and analysis clearly in written form using logical proofs.	• Analysis Assignments • Algebra Assignments • Class Test • Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Final Exam Assessment Format: Individual	50%	Due Date: During the exam period
Analysis Assignments Assessment Format: Individual	25%	Due Date: Week 8 and Week 10
Algebra Assignments Assessment Format: Individual	10%	Due Date: Week 2 and Week 4
Class Test Assessment Format: Individual	15%	Start Date: Not Applicable Due Date: Week 5

Assessment Details

Final Exam

Assessment Overview

The final exam is designed to summarise your learning and problem-solving skills on all topics delivered across the term, including material from lectures and tutorials. The exam is typically 2 hours long with 10 minutes reading time. Questions will cover all course content though there may be more emphasis on some topics which have not appeared in the assignments - details will be confirmed during the course. You will be expected to write proofs and perform calculations to solve problems. The examination will occur during the official university examination period. Feedback is available through inquiry with the course convenor.

Course Learning Outcomes

- CLO1 : Describe the importance of groups in modern mathematics, particularly algebra and geometry through several important cases and their applications.
- CLO2 : Use and manipulate several fundamental inequalities in diverse settings.
- CLO3 : Communicate arguments in algebra and analysis clearly in written form using logical proofs.

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.
For more information on Generative AI and permitted use please see here.

Analysis Assignments

Assessment Overview

This assessment consists of two assignments on the Analysis content. The first is worth 10% and the second is worth 15%. You will have two weeks to complete each assignment, which will involve writing proofs and performing calculations. The two halves of the course are independent, with the order of delivery determined each time the course is delivered. If the Analysis content is delivered in the second half of the term, then the two assignments will be due in weeks 8 and 10. Feedback and solutions of the first assignment will be given in week 9 and they will inform the second assignment.

Course Learning Outcomes

- CLO2 : Use and manipulate several fundamental inequalities in diverse settings.
- CLO3 : Communicate arguments in algebra and analysis clearly in written form using logical proofs.

Generative AI Permission Level

No Assistance

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Algebra Assignments

Assessment Overview

This assessment consists of two short assignments on the Algebra content. Each is worth 5%. You will have one week to complete each assignment, which will involve writing proofs and performing calculations.
The two halves of the course are independent, with the order of delivery determined each time the course is delivered. If the Algebra content is delivered in the first half of the term, then the two assignments will be due in weeks 2 and 4.
Feedback and solutions of the first assignment will be given in week 3 and they will inform the second assignment, and will help you prepare for the class test.

Course Learning Outcomes

- CLO1 : Describe the importance of groups in modern mathematics, particularly algebra and geometry through several important cases and their applications.
- CLO3 : Communicate arguments in algebra and analysis clearly in written form using logical proofs.

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.
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Class Test

Assessment Overview

There will be one class test covering the material related to algebra in Week 5, worth 15% of the course assessments. This is designed to assess your knowledge of the topics covered in Weeks 1-4 inclusive. The assignments of the first part of the course will help you prepare for the test. You will be provided with feedback with comments and/or solutions within two weeks of completing the test.

Course Learning Outcomes

- CLO1 : Describe the importance of groups in modern mathematics, particularly algebra and geometry through several important cases and their applications.
- CLO3 : Communicate arguments in algebra and analysis clearly in written form using logical proofs.

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.
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General Assessment Information

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 after any extensions granted for Special Consideration or Equitable Learning Provisions.) For example, an assessment task that was awarded 75% would be given 65% if it was 1-2 days late. Any assessment task submitted 7 or more days late will be given zero.

Grading Basis

Standard

Requirements to pass course

More that 50% mark overall.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 9 September - 15 September	Lecture	Transformations, groups, isometries, reflections, congruence and symmetries
Week 2 : 16 September - 22 September	Lecture	Rotations, Classification of plane isometries, similarities, dilations
	Assessment	Assignment 1 published
Week 3 : 23 September - 29 September	Lecture	Classification of plane similarities, more on groups, collineations
Week 4 : 30 September - 6 October	Lecture	Affine transformations, the projective plane, the duality principle
	Assessment	Assignment 2 published
Week 5 : 7 October - 13 October	Lecture	Projective transformations; Asymptotics
	Assessment	In-class test
	Assessment	Assignment 3 published
Week 7 : 21 October - 27 October	Lecture	Inequalities
Week 8 : 28 October - 3 November	Lecture	Norms, convex bodies
	Assessment	Assignment 4 published
Week 9 : 4 November - 10 November	Lecture	Duality
Week 10 : 11 November - 17 November	Lecture	Absolute values

Attendance Requirements

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

General Schedule Information

This is available from Moodle.

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.

Course Resources

Prescribed Resources

Refer to the Moodle page for this course.

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
Convenor	Behrouz Taj i		H13 Anita Lawrence Building East (Red Center) 4077			Yes	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 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.**