



UNSW Course Outline

MATH5505 Combinatorics - 2024

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General Course Information

Course Code : MATH5505

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 : Postgraduate

Units of Credit : 6

Useful Links

[Handbook Class Timetable](#)

Course Details & Outcomes

Course Description

This is a course for graduate and advanced undergraduate students, forming an introduction to modern combinatorics. The emphasis is on theory, proof and problem solving. Topics may include extremal set theory, extremal graph theory, Ramsey theory and arithmetic combinatorics. Combinatorial methods taught in this course range from the pigeonhole principle, double

counting, and the linear algebra method to possibly generating functions or the probabilistic method. Exact content depends on the lecturer-in-charge. Content is delivered in lectures and explored in tutorials.

Course Aims

The aim of this course is to introduce advanced mathematics students to modern combinatorics with an emphasis on developing independent problem-solving skills. Space for solving hard problems is provided during the tutorials where students work in small groups on a set of problems and tutors interfere only minimally. The combinatorial thinking developed in this course finds applications in many other areas of mathematics and theoretical computer science.

Course Learning Outcomes

| Course Learning Outcomes |
|--|
| CLO1 : State and prove classical theorems of combinatorics. |
| CLO2 : Identify appropriate techniques to solve simple and complex combinatorial problems. |
| CLO3 : Communicate mathematics clearly in written form using formal proofs. |

| Course Learning Outcomes | Assessment Item |
|--|--|
| CLO1 : State and prove classical theorems of combinatorics. | <ul style="list-style-type: none">Final Exam |
| CLO2 : Identify appropriate techniques to solve simple and complex combinatorial problems. | <ul style="list-style-type: none">Assignment 1Assignment 2Final Exam |
| CLO3 : Communicate mathematics clearly in written form using formal proofs. | <ul style="list-style-type: none">Assignment 1Assignment 2Final Exam |

Learning and Teaching Technologies

Moodle - Learning Management System

Assessments

Assessment Structure

| Assessment Item | Weight | Relevant Dates |
|---|--------|--|
| Assignment 1 Assessment Format: Individual | 15% | Start Date: Not Applicable Due Date: Typically due at the start of Week 3 |
| Assignment 2 Assessment Format: Individual | 25% | Start Date: Not Applicable Due Date: Typically due at the start of Week 8 |
| Final Exam Assessment Format: Individual | 60% | Start Date: Not Applicable Due Date: During the exam period |

Assessment Details

Assignment 1

Assessment Overview

The first assignment will be released during Week 1 and will be due during Week 3. You will be asked to solve some problems and write a selection of proofs based on material from the first two weeks of the course. You will have approximately two weeks to work on the assignment. You may discuss the solutions with your peers but must write up your assignment on your own. Feedback will be given in the form of marks and comments from academic staff within 2 weeks of submission.

Course Learning Outcomes

- CLO2 : Identify appropriate techniques to solve simple and complex combinatorial problems.
- CLO3 : Communicate mathematics clearly in written form using formal proofs.

Detailed Assessment Description

See Moodle for details.

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

Simple Editing Assistance

In completing this assessment, you are permitted to use standard editing and referencing functions in the software you use to complete your assessment. These functions are described

below. You must not use any functions that generate or paraphrase passages of text or other media, whether based on your own work or not.

If your Convenor has concerns that your submission contains passages of AI-generated text or media, you may be asked to account for your work. If you are unable to satisfactorily demonstrate your understanding of your submission you may be referred to UNSW Conduct & Integrity Office for investigation for academic misconduct and possible penalties.

For more information on Generative AI and permitted use please see [here](#).

Permitted are low-level grammar and spellchecking, mainly for students whose mother tongue is not English. If your Convenor has concerns that your submission contains passages of AI-generated text or media, you may be asked to account for your work. This may include that you gave to explain your work in a short oral test to the convenor.

Assignment 2

Assessment Overview

The second assignment will be released during Week 5 and will be due during Week 8. You will be asked to solve some problems and write a selection of proofs based on content from Weeks 3 - 5 of lectures. You will have approximately three weeks to work on the assignment. You may discuss the solutions with your peers but must write up your assignment on your own. Feedback will be given in the form of marks and comments from academic staff within two weeks of submission.

Course Learning Outcomes

- CLO2 : Identify appropriate techniques to solve simple and complex combinatorial problems.
- CLO3 : Communicate mathematics clearly in written form using formal proofs.

Detailed Assessment Description

See Moodle for details.

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

Simple Editing Assistance

In completing this assessment, you are permitted to use standard editing and referencing functions in the software you use to complete your assessment. These functions are described below. You must not use any functions that generate or paraphrase passages of text or other

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Final Exam

Assessment Overview

The final exam is designed to summarise your learning and problem-solving skills on all topics delivered across all weeks of the Term, including material from lectures and tutorials. The exam is typically 2 hours long with an additional 10 minutes of reading time. Questions will cover all topics. The examination will occur during the official university examination period. Feedback is available through inquiry with the Course Convenor.

Course Learning Outcomes

- CLO1 : State and prove classical theorems of combinatorics.
- CLO2 : Identify appropriate techniques to solve simple and complex combinatorial problems.
- CLO3 : Communicate mathematics clearly in written form using formal proofs.

Assignment submission Turnitin type

Not Applicable

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](#).

General Assessment Information

No late submissions will be accepted past the deadline.

Grading Basis

Standard

Course Schedule

| Teaching Week/Module | Activity Type | Content |
|--------------------------------------|---------------|--|
| Week 1 : 9 September - 15 September | Seminar | Chains, antichains and shadows |
| Week 2 : 16 September - 22 September | Seminar | Chains, antichains and shadows |
| Week 3 : 23 September - 29 September | Seminar | Intersecting set systems and linear-algebra method |
| Week 4 : 30 September - 6 October | Seminar | Intersecting set systems and linear-algebra method |
| Week 5 : 7 October - 13 October | Seminar | Extremal graph theory |
| Week 7 : 21 October - 27 October | Seminar | Extremal graph theory |
| Week 8 : 28 October - 3 November | Seminar | Graph regularity |
| Week 9 : 4 November - 10 November | Seminar | Arithmetic combinatorics |
| Week 10 : 11 November - 17 November | Seminar | Arithmetic combinatorics, revision if time allows |

Attendance Requirements

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

General Schedule Information

There will be roughly four tutorials (2h each) during the term, scheduled during the seminar time.

The exact lecture/tutorial schedule will be published on Moodle.

Course Resources

Recommended Resources

Details will be provided on Moodle.

Staff Details

| Position | Name | Email | Location | Phone | Availability | Equitable Learning Services Contact | Primary Contact |
|----------|----------------|-------|----------|-------|--------------|-------------------------------------|-----------------|
| | Anita Liebenau | | | | | 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 Plagiarism

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.**