

MATH1064: Discrete Mathematics for Computation

Semester 2, 2019 | 6 Credit points | Mode of delivery: Normal (lecture/lab/tutorial) day | Unit type: Standard

Coordinator: Sharon Stephen

Faculty of Science (SCIE), Mathematics and Statistics Academic Operations

Unit description

This unit introduces students to the language and key methods of the area of Discrete Mathematics. The focus is on mathematical concepts in discrete mathematics and their applications, with an emphasis on computation. For instance, to specify a computational problem precisely one needs to give an abstract formulation using mathematical objects such as sets, functions, relations, orders, and sequences. In order to prove that a proposed solution is correct, one needs to apply the principles of mathematical logic, and to use proof techniques such as induction. To reason about the efficiency of an algorithm, one often needs to estimate the growth of functions or count the size of complex mathematical objects. This unit provides the necessary mathematical background for such applications of discrete mathematics. Students will be introduced to mathematical logic and proof techniques; sets, functions, relations, orders, and sequences; counting and discrete probability; asymptotic growth; and basic graph theory.

Prohibitions: MATH1004 or MATH1904

Pre-requisites : None

Co-requisites : None

Assumed knowledge: None

Unit aims

The aims of this unit are to: introduce basic concepts of combinatorics - permutations, selections and arrangements; introduce basic concepts and applications of discrete probability theory; introduce methods of proof, including induction; introduce basic operations on Boolean functions and to illustrate how they apply in mathematical logic; introduce prime numbers and their basic properties; illustrate how to find solutions of recurrence relations.

Learning outcomes

At the completion of this unit, you should be able to:

- LO1. construct logically correct and mathematically sound proofs
- LO2. apply concepts of logic, set theory, relations, induction, principles of counting, probability, algebraic structures, elementary number theory and asymptotic growth to mathematical and computational problems in more advanced courses
- LO3. demonstrate an understanding and well-founded knowledge of the mathematics presented in this course and thus be able to apply techniques from this course to solve both familiar and novel problems
- LO4. understand some applications of mathematics to relevant fields, such as computer programming and logic.

Graduate qualities

The Graduate Qualities are the qualities and skills that all University of Sydney graduates must demonstrate on successful completion of an award course. As a future Sydney graduate, the set of qualities have been designed to equip you for the contemporary world.

Please see <https://sydney.edu.au/students/graduate-qualities.html>

Study commitment

- Typically, there is a minimum expectation of 1.5-2 hours of student effort per week per credit point for units of study offered over a full semester. For a 6 credit point unit, this equates to roughly 120-150 hours of student effort in total.

Teaching staff and contact details

Coordinator : Sharon Stephen, sharon.stephen@sydney.edu.au

Teaching staff : Jonathan Spreer, jonathan.spreer@sydney.edu.au

Administrative and professional staff: MATH1064@sydney.edu.au



Learning activities schedule

Week	Topic	Learning activity type	Learning outcomes
Week 1	Logic: propositional and first order	Lecture	LO1, LO2, LO3, LO4
Week 2	Inference and proofs	Lecture and tutorial	LO1, LO2, LO3, LO4
Week 3	Sets, functions, and sequences	Lecture and tutorial	LO1, LO2, LO3, LO4
Week 4	Number theory	Lecture and tutorial	LO1, LO2, LO3, LO4
Week 5	Asymptotic growth	Lecture and tutorial	LO1, LO2, LO3, LO4
Week 6	Induction and recursion	Lecture and tutorial	LO1, LO2, LO3, LO4
Week 7	Counting (Basics)	Lecture and tutorial	LO1, LO2, LO3, LO4
Week 8	Counting (Advanced)	Lecture and tutorial	LO1, LO2, LO3, LO4
Week 9	Discrete probability	Lecture and tutorial	LO1, LO2, LO3, LO4
Week 10	Relations	Lecture and tutorial	LO1, LO2, LO3, LO4
Week 11	Graphs	Lecture and tutorial	LO1, LO2, LO3, LO4
Week 12	Modelling computation: regular languages and DFAs	Lecture and tutorial	LO1, LO2, LO3, LO4
Week 13	Modelling computation and revision	Lecture and tutorial	LO1, LO2, LO3, LO4

Assessments

Assessment title	Assessment category	Assessment type	Assessment type description	Individual or group	Weight	Due date & time	Closing date	Length/duration	Learning outcomes
Assignment 1	Submitted work	Assignment	n/a	Individual	5%	Week 4 29 August 2019 11.59pm	08/09/19 23:59	n/a	LO1, LO2
Quiz 1	In-class assessment	Tutorial quiz, small test or online task	n/a	Individual	10%	Week 6		40 minutes	LO1, LO2
Quiz 2	In-class assessment	Tutorial quiz, small test or online task	n/a	Individual	10%	Week 10		40 minutes	LO1, LO2
Assignment 2	Submitted work	Assignment	n/a	Individual	5%	Week 11 24 October 2019 11.59pm	03/11/19 23:59	n/a	LO1, LO2, LO3
Exam	Exam	Final exam	n/a	Individual	60%	Formal exam period		2 hours	LO1, LO2, LO3, LO4
Online quiz	In-class assessment	Tutorial quiz, small test or online task	n/a	Individual	10%	Weekly		n/a	LO2, LO3

Assessment summary

- **Quizzes:** Quizzes will be held during practice classes. You must sit for the quiz during the practice class in which you are enrolled, unless you have permission from the Student Services Office, issued only for verifiable reasons. Otherwise, your quiz mark may not be recorded. Quizzes will only be returned in the practice class you sat the quiz and must be collected by week 13. The better mark principle will be used for the quizzes so do not submit an application for Special Consideration or Special Arrangements if you miss a quiz. The better mark principle means that for each quiz, the quiz counts if and only if it is better than or equal to your exam mark. If your quiz mark is less than your exam mark, the exam mark will be used for that portion of your assessment instead.
- **Assignments:** There are two assignments, which must be submitted electronically, as PDF files only, in Turnitin (an internet-based plagiarism-prevention service), via the Learning Management System (Canvas) website by the deadline. Note that your assignment will not be marked if it is illegible or if it is submitted sideways or upside down. It is your responsibility to check that your assignment has been submitted correctly (check that you can view each page). Late submissions will receive a penalty.
- **Online quizzes:** Each week, there will be a practice quiz and a quiz that counts towards your final mark. There will be 12 quizzes (each worth 1%), and we will count the ten best marks (hence at most 10% of your mark is made up of these on-line quizzes.) The better mark principle will be used for the quizzes so do not submit an application for Special Consideration or Special Arrangements if you miss a quiz.
- Detailed information for each assessment can be found on Canvas.

Prescribed readings

- **Recommended textbook:** Discrete Mathematics and Its Applications (Eighth Edition) by Kenneth H. Rosen

Other resources

- **Tutorial and exercise sheets:** The question sheets for a given week will be available on the MATH1064 webpage. Solutions to tutorial exercises for week n will usually be posted on the web by the afternoon of the Friday of week n .
- **Practice classes:** Practice classes (one per week) start in Week 2. You should attend the practice class given on your personal timetable.
- **Ed Discussion forum:** <https://edstem.org>

Late penalties

The [Assessment Procedures 2011](#) provide that any written work submitted after 11:59pm on the due date will be penalised by 5% of the maximum awardable mark for each calendar day after the due date. If the assessment is submitted more than ten calendar days late, a mark of zero will be awarded.

However, a unit of study may prohibit late submission or waive late penalties only if expressly stated below.

Special consideration

A [special consideration application](#) can be made for short-term circumstances beyond your control, such as illness, injury or misadventure, which affect your preparation or performance in an assessment.

If you are eligible for special consideration, you must submit an online application and supporting documents within three working days of the assessment, unless exceptional circumstances apply.

Assessment grading

The University awards common result grades, set out in the [Coursework Policy 2014](#) (Schedule 1).

As a general guide, a high distinction indicates work of an exceptional standard, a distinction a very high standard, a credit a good standard, and a pass an acceptable standard.

Result name	Mark range	Description
High distinction	85 - 100	Representing complete or close to complete mastery of the material.
Distinction	75 - 84	Representing excellence, but substantially less than complete mastery.
Credit	65 - 74	Representing a creditable performance that goes beyond routine knowledge and understanding, but less than excellence.
Pass	50 - 64	Representing at least routine knowledge and understanding over a spectrum of topics and important ideas and concepts in the course.
Fail	0 - 49	When you don't meet the learning outcomes of the unit to a satisfactory standard.

For more information see sydney.edu.au/students/guide-to-grades.

Educational integrity

While the University is aware that the vast majority of students and staff act ethically and honestly, it is opposed to and will not tolerate academic dishonesty or plagiarism and will treat all allegations of dishonesty seriously.

All written assignments submitted in this unit of study will be submitted to the similarity detection software known as Turnitin. Turnitin searches for matches between text in your written assessment task and text sourced from the Internet, published works and assignments previously submitted to Turnitin. If such matches indicate evidence of plagiarism or other forms of dishonesty to your teacher, they are required to report your work for further investigation.

Further information on academic honesty, academic dishonesty, and the resources available to all students can be found on the academic integrity pages on the current students website: <https://sydney.edu.au/students/academic-integrity.html>

Work, health and safety requirements

We are governed by the Work Health and Safety Act 2011, Work Health and Safety Regulation 2011 and Codes of Practice. Penalties for non-compliance have increased. Everyone has a responsibility for health and safety at work. The University's [Work Health and Safety policy](#) explains the responsibilities and expectations of workers and others, and the procedures for managing WHS risks associated with University activities.

Other requirements

- **Attendance:** Students are expected to attend a minimum of 80% of timetabled activities for a unit of study, unless granted exemption by the Associate Dean. For some units of study the minimum attendance requirement, as specified in the relevant table of units or the unit of study outline, may be greater than 80%.
- **Tutorial attendance:** Tutorials (one per week) start in Week 2. You should attend the tutorial given on your personal timetable. Attendance at tutorials will be recorded. Your attendance will not be recorded unless you attend the tutorial in which you are enrolled. While there is no penalty if 80% attendance is not met we strongly recommend you attend tutorials regularly to keep up with the material and to engage with the tutorial questions. Since there is no assessment associated with the tutorials do not submit an application for Special Consideration or Special Arrangements for missed tutorials.

Site visit guidelines

There are no site visit guidelines for this unit.

Additional costs

There are no additional costs for this unit.

Closing the loop

No changes have been made since this unit was last offered.

Links to policies and other information for students

The following information and services are available to all students:

- Student administration: sydney.edu.au/study/student-administration.html
- Wellbeing and support: sydney.edu.au/students/health-wellbeing.html
- Study resources: sydney.edu.au/students/learning-services.html
- Expectations of student conduct: sydney.edu.au/students/student-responsibilities.html
- Learning and Teaching Policy: sydney.edu.au/policies/
- Academic appeals: sydney.edu.au/students/academic-appeals.html
- Libraries: sydney.edu.au/students/libraries.html
- Financial support: sydney.edu.au/students/financial-support.html

Other relevant information

More information can be found on Canvas.

Other links

Science student portal (canvas.sydney.edu.au/courses/7114)

Mathematics and Statistics student portal (canvas.sydney.edu.au/courses/7913)