DMTH137

Discrete Mathematics I

S2 Day 2016

Dept of Mathematics

Contents

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General Information

Unit convenor and teaching staff
Unit Convenor
Ross Moore
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Contact via 9850 8955
AHH 2.638, Level 2

Credit points
3

Prerequisites

Corequisites

Co-badged status

Unit description
This unit provides a background in the area of discrete mathematics to provide an adequate foundation for further study in computer science. It is also of great interest to students wishing to pursue further study in mathematics. In this unit, students study propositional and predicate logic; methods of proof; fundamental structures in discrete mathematics such as sets, functions, relations and equivalence relations; Boolean algebra and digital logic; elementary number theory; graphs and trees; and elementary counting techniques.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

Knowledge of the principles and concepts of a broad range of areas in mathematical sciences with depth in at least one area

Understanding of the breadth of the discipline, its role in other fields, and the way other fields contribute to the development of the mathematical sciences

Ability to construct logical, clearly presented and justified mathematical arguments incorporating deductive reasoning

Ability to formulate and model practical and abstract problems in mathematical and/or statistical terms using a variety of methods

Application of mathematical and/or statistical principles, concepts, techniques and technology to solve practical and abstract problems.

Appropriate interpretation of information communicated in mathematical and/or statistical form

Appropriate presentation of information, reasoning and conclusions in a variety of modes, to diverse audiences (expert and non-expert).

Ethical application of mathematical and statistical approaches to solving problems

Ability to work effectively, responsibly and safely in an individual or team context.

Assessment Tasks

Name	Weighting	Due
Assignments	30%	See iLearn
Tutorial work	20%	weekly
Final Examination	50%	University examination period

Assignments

Due: **See iLearn**
Weighting: **30%**

Three assignments each weighted at 10%.

On successful completion you will be able to:

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modes, to diverse audiences (expert and non-expert).

- Ethical application of mathematical and statistical approaches to solving problems
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Tutorial work

Due: **weekly**
Weighting: **20%**

Recorded tutorial attendance and marked in-tutorial questions. Only students who attend the whole tutorial session will have their work graded. The best 8 marks during the unit will contribute to 20% of the grade for the unit.

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Final Examination

Due: **University examination period**
Weighting: **50%**

Two hour final exam covering any aspect of the unit.

On successful completion you will be able to:
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Delivery and Resources

Classes

Lectures: you should attend both lectures on each of two days each week, making a total of four hours.

Tutorials: you should attend one 2-hour tutorial each week.

Workshops: the Numeracy Centre runs regular workshops for students in this unit.

Required and Recommended Texts and/or Materials

The required text for DMTH137 is DMTH137 Discrete Mathematics by Chris Cooper.

RECOMMENDED READING

- Kenneth H Rosen, Discrete Mathematics and its Applications, any edition
- CDH Cooper, *Mathematics at the Edge of the Rational Universe*
- Grimaldi, *Discrete and Combinatorial Mathematics* (Addison-Wesley-Longman 2003)
- RL Graham, DE Knuth, O Patashnik, Concrete mathematics: a foundation for computer science (Addison-Wesley 1994)
- WD Hillis, The pattern on the stone. The simple ideas that make computers work. (Weidenfeld, Nicolson 1998)
- A Hodges, Alan Turing: the enigma (Vintage 1992)
- DR Hofstadter, Godel, Escher, Bach: an eternal braid (1979) The Harvester Press

- DE Knuth, The art of computer programming – Fundamental algorithms (1973) Addison-Wesley
- M Minsky, Computation: finite and infinite machines (1967) Prentice-Hall
- S Singh, The Code Book (1999) Fourth Estate

These and similar texts are available in the Library.

Technology Used and Required

Students are expected to have access to an internet-enabled computer with a web browser and Adobe Reader software. Most areas of the university provide wireless access for portable devices. There are computers for student use in the Library and in the Numeracy Centre (C5A 255).

Difficulties with your home computer or internet connection do not constitute a reasonable excuse for lateness of, or failure to submit, assessment tasks.

Unit Schedule

WEEK	BEGINNING	MONDAY LECTURES	FRIDAY LECTURES	TASK DUE
1	1/8/2016	Propositional logic, truth tables	Laws of logic	
2	8/8/2016	Predicate logic and negation, Proofs	Sets: operations on sets, Cartesian products, power sets	
3	15/8/2016	Relations: symmetry , reflexivity, transitivity, equivalence Undirected, directed and weighted graphs; degree of a vertex; equivalent graphs;	Complete graphs: bipartite graphs; Walks, paths and cycles; Trees and Forests;	X3
4	22/8/2016	Euler's formula; Planar graphs; Euler and Hamiltonian cycles	Induction Proofs	X4
5	29/8/2016	Minimal spanning trees; Kruskal's algorithm; Prim's algorithm	Graph colouring; Chromatic polynomial	X5
6	5/9/2017	Functions: injectivity, surjectivity, invertibility	Properties of natural numbers; induction; Euclid's algorithm	A1,X6
7	12/9/2016	Vectors, polygonal shapes	Matrices and Linear Transformations	X7
MID-SESSION BREAK				
8	4/10/2016	—— **public holiday** ——	Principle of Inclusion–Exclusion	X8

9	10/10/2016	Combinatorics: counting arguments, permutations and combinations	The Binomial Theorem and Extended Binomial Theorem	A2, X9
10	17/10/2016	Prime numbers; finding primes; congruences	Binary numbers and arithmetic, arithmetic modulo n	X10
11	24/10/2016	Inverses and powers modulo n		X11
12	31/10/2016	Boolean algebra, Logic gates	Minimisation of digital circuits	X12, A3
13	7/11/2016	**Revision (or unfinished topics)**	**Revision**	X13

Learning and Teaching Activities

Lectures

Four one hour lectures per week

Tutorial

One two hour tutorial per week

Workshop

Optional workshops provided by Numeracy Centre

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

New Assessment Policy in effect from Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy_2016.html. For more information visit http://students.mq.edu.au/events/2016/07/19/new_assessment_policy_in_place_from_session_2/

Assessment Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the Learning and Teaching Category of Policy Central.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be

imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Knowledge of the principles and concepts of a broad range of areas in mathematical sciences with depth in at least one area
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Assessment tasks

- Assignments
- Final Examination

Learning and teaching activities

- Four one hour lectures per week
- One two hour tutorial per week

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcomes

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- Ethical application of mathematical and statistical approaches to solving problems
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Learning and teaching activities

- Four one hour lectures per week
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Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

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Learning and teaching activities

- One two hour tutorial per week
- Optional workshops provided by Numeracy Centre

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

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Assessment tasks

- Assignments
- Tutorial work
- Final Examination

Learning and teaching activities

- Four one hour lectures per week
- One two hour tutorial per week
- Optional workshops provided by Numeracy Centre

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to

critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

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- One two hour tutorial per week
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Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

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Learning and teaching activities

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Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- Appropriate interpretation of information communicated in mathematical and/or statistical form
- Appropriate presentation of information, reasoning and conclusions in a variety of modes, to diverse audiences (expert and non-expert).

Assessment tasks

- Assignments
- Tutorial work
- Final Examination

Learning and teaching activities

- Four one hour lectures per week
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Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcome

- Ethical application of mathematical and statistical approaches to solving problems

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcomes

- Ethical application of mathematical and statistical approaches to solving problems
- Ability to work effectively, responsibly and safely in an individual or team context.

Changes since First Published

Date	Description
18/ 08/ 2016	Changed Assignment 1 due date from end of Week 5 to Monday of Week 6. Rearranged topics in the Unit Outline, to agree better with the actual order of coverage in the lectures.