



# COMP333

## Algorithm Theory and Design

S2 Day 2016

*Dept of Computing*

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#### **Disclaimer**

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## General Information

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Credit points

3

Prerequisites

39cp including (COMP225 and DMTH237)

Corequisites

Co-badged status

Unit description

This unit covers general issues of the theory of computation and algorithm design, including computability and complexity. The general principles are illustrated by designing several very efficient algorithms with applications in telecommunication networks, cryptography and other important fields.

## 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:

- Have advanced algorithmic knowledge in order to tackle concrete problems and provide adapted algorithmic solutions
- Possess relevant technical skills
- Communicate clearly and effectively
- Work collaboratively in small teams

## Assessment Tasks

Name	Weighting	Due
<a href="#">Weekly exercises</a>	10%	Week 1 to week 12
<a href="#">In class tests</a>	20%	Weeks 7 & 12
<a href="#">Assignment 1</a>	20%	weeks 5 & 7
<a href="#">Assignment 2</a>	20%	weeks 9 & 12
<a href="#">Final Examination</a>	30%	During Exam period

### Weekly exercises

Due: **Week 1 to week 12**

Weighting: **10%**

Each week, a set of exercises will be made available online. All the questions (except the last one) will be discussed during your workshop class. You are expected to address the last question and you must submit your solution electronically (in the form of a PDF file) before the deadline (usually 11pm every Sunday). Feedback will be given the following week on the submitted questions; a selection of these questions will be used as a basis for the class tests.

The mark will be computed based on the 10 best (out of 12) submissions.

**To pass the unit, you must get a mark of 2 or above (out of 5) for at least 8 weekly submissions. No late submissions.**

On successful completion you will be able to:

- Have advanced algorithmic knowledge in order to tackle concrete problems and provide adapted algorithmic solutions
- Possess relevant technical skills

### In class tests

Due: **Weeks 7 & 12**

Weighting: **20%**

In class tests (typically 40 mins) will assess the understanding of the course material. Questions

in the tests will be closely based on a selection of the submitted weekly exercises.

On successful completion you will be able to:

- Have advanced algorithmic knowledge in order to tackle concrete problems and provide adapted algorithmic solutions

## Assignment 1

Due: **weeks 5 & 7**

Weighting: **20%**

This assignment is organised into two sub-tasks. So there are two submission deadlines for this assignment. Both parts will be submitted online. The first part is to be done individually, whereas the second part will be completed both individually and collaboratively in a **team** in order to mimic a real software development project and to give you a chance to fully appreciate the advantages of System Design. A short (5-7 minutes) presentation will be a part of the assessment.

On successful completion you will be able to:

- Have advanced algorithmic knowledge in order to tackle concrete problems and provide adapted algorithmic solutions
- Possess relevant technical skills
- Communicate clearly and effectively
- Work collaboratively in small teams

## Assignment 2

Due: **weeks 9 & 12**

Weighting: **20%**

This assignment is organised into two sub-tasks. So there are two submission deadlines for this assignment. Both parts will be submitted online. The first part is to be done individually, whereas the second part will be completed in a **team** in order to mimic a real software development project and to give you a chance to fully appreciate the advantages of System Design. A short (5-7 minutes) presentation will be a part of the assessment.

On successful completion you will be able to:

- Have advanced algorithmic knowledge in order to tackle concrete problems and provide adapted algorithmic solutions
- Possess relevant technical skills
- Communicate clearly and effectively

- Work collaboratively in small teams

## Final Examination

Due: **During Exam period**

Weighting: **30%**

The final examination will be a two-hour examination (closed book) held during the usual University examination period and will cover all topics.

You must get a mark of **at least 40%** in the final examination to pass the unit.

On successful completion you will be able to:

- Have advanced algorithmic knowledge in order to tackle concrete problems and provide adapted algorithmic solutions
- Communicate clearly and effectively

## Delivery and Resources

### CLASSES

Each week you should attend three hours of lectures, a two hour mixed class (a tutorial and a practical combined in a single session). For details of days, times and rooms consult the [timetables webpage](#).

A snapshot of the timetables webpage for COMP333 as of July 16, 2015 is:

- 13 lectures: Monday 2-4pm, weeks 31--37 and 41--45, [E5A 150 Tutorial Rm](#) (week 40, October 3rd is a holiday)
- 13 lectures: Tuesday 10-11am, weeks 31--37 and 40--45, [E5A 150 Tutorial Rm](#)
- 12 workshop: Tuesday 11am-1pm, weeks 32--37 and 40--45, [E6A 119 Faculty PC Lab](#)

Please note that **Workshops commence in Week 1** and that you are **required** to attend the Workshops and hand in prepared work each week. Failure to do so may result in you being excluded from the exam. Indeed the Executive Dean of the Faculty or delegated authority has the power to refuse permission to attend the final examination.

We recommend that during Week 1 you make sure that you can successfully login into your account, and also access unit's materials via [iLearn](#).

### REQUIRED AND RECOMMENDED TEXTS AND/OR MATERIALS

#### Textbooks

The following textbooks are recommend but not required for COMP333:

- [1] S. S. Skiena, The Algorithm Design Manual, Springer, 2nd edition, 2008, ISBN: 978-1-84800-069-8. Electronic version may be available from the library.

- [2] T. H. Cormen, C. E. Leiserson, R. L. Rivest, & C. Stein, Introduction to Algorithms (MIT Press) 3rd edition. ISBN 0-262-53305-7.

They should be available from the University Co-op Bookshop and/or library.

## UNIT WEBPAGE AND TECHNOLOGY USED AND REQUIRED

### Echo360

[http://mq.edu.au/iLearn/student\\_info/lecture\\_recordings.htm](http://mq.edu.au/iLearn/student_info/lecture_recordings.htm)

Digital recordings of lectures are available. Please follow these [instructions](#) to access the recordings.

### Technology

Object-oriented technology & languages: Java

Version control: git/mercurial

### Websites

This unit will use [iLearn](#) to distribute materials and for submission of work.

### Discussion Boards

The unit makes use of discussion boards hosted within [iLearn](#). Please post questions there, they are monitored by the staff on the unit.

### Late submissions

No late submissions.

## Unit Schedule

Week	Topic	Reading
1	Introduction to Design and Correctness	Chap. 1 in [1]
2	Algorithm analysis, big-oh notation	Chap. 2 in [1], Chap 3 in [2]
3	Greedy Algorithms	Chap. 8 in [1], Chap. 16 in [2]
4	Dynamic Programming	Chap 8 in [1], Chap 15 in [2]
5	String algorithms	Chap. 18 in [1], Chap 32 in [2]
6	Graph algorithms I	Chap 5 and 6 in [1], Chap. 6 in [2]
7	<b>In-class test. Sep. 13, 10am--11am</b> Revision questions & answers	
	<b>Recess 19-30 September</b>	

8	Labour day, no lecture and no workshop	
9	Graphs algorithms II	Chap 5 and 6 in [1], Chap. 6 in [2]
10	Complexity I. Proving hardness	Chap. 9 in [1]
11	Complexity II. Hard problems	Chap. 9 in [1], chap. 34 in [2]
12	<b>In-class test. Nov 1st, 10am--11am.</b> Complexity III. Approximating NP-complete problems	Chap. 9 and 16 in [1], chap. 34 and 35 in [2]
13	Complexity IV. Introduction to space complexity Revision.	

## 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](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](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/](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](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](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/](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](http://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](http://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](http://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/](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 outcome

- Have advanced algorithmic knowledge in order to tackle concrete problems and provide adapted algorithmic solutions

### Assessment tasks

- Assignment 1
- Assignment 2



## 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 outcome

- Have advanced algorithmic knowledge in order to tackle concrete problems and provide adapted algorithmic solutions

### Assessment tasks

- Assignment 1
- Assignment 2

## 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:

### Learning outcomes

- Have advanced algorithmic knowledge in order to tackle concrete problems and provide adapted algorithmic solutions
- Possess relevant technical skills
- Communicate clearly and effectively
- Work collaboratively in small teams

### Assessment task

- In class tests

## 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.

This graduate capability is supported by:

## **Learning outcomes**

- Have advanced algorithmic knowledge in order to tackle concrete problems and provide adapted algorithmic solutions
- Possess relevant technical skills
- Work collaboratively in small teams

## **Assessment tasks**

- Weekly exercises
- In class tests
- Assignment 1
- Assignment 2
- Final Examination

## **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 outcome**

- Have advanced algorithmic knowledge in order to tackle concrete problems and provide adapted algorithmic solutions

## **Assessment tasks**

- Assignment 1
- Assignment 2
- Final Examination

## **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**

- Have advanced algorithmic knowledge in order to tackle concrete problems and provide adapted algorithmic solutions
- Possess relevant technical skills
- Work collaboratively in small teams

## **Assessment tasks**

- Weekly exercises
- In class tests
- Assignment 1
- Assignment 2
- Final Examination

## **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**

- Have advanced algorithmic knowledge in order to tackle concrete problems and provide adapted algorithmic solutions
- Communicate clearly and effectively
- Work collaboratively in small teams

## **Assessment tasks**

- Assignment 1
- Assignment 2
- Final Examination

## **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 outcomes

- Communicate clearly and effectively
- Work collaboratively in small teams

## 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

- Communicate clearly and effectively
- Work collaboratively in small teams

## Changes from Previous Offering

The second part of the unit now focuses on complexity rather than Number Theory algorithms.

## Grading

At the end of the session, you will receive a mark that reflects your achievement in the unit. The final mark for the unit will be calculated by combining the marks for all assessment tasks according

The final examination in this unit is a **hurdle requirement**. You must get a mark of **at least 40%** in the exam

If you get a mark of at least 30% in your first attempt at the final examination you will be given a second and

The weekly exercise submissions in this unit are a **hurdle requirement: to pass the unit, you must get a mark of 2 or above (out of 5) for at least 8 weekly submissions. No late submissions.**