



COMP333

Algorithm Theory and Design

S2 Evening 2015

Dept of Computing

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General Information

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Credit points

3

Prerequisites

39cp and COMP225(P) and (DMTH237(P) or MATH237(P))

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
<u>Weekly</u>	10%	Week 1 to week 12
<u>In class tests</u>	20%	Weeks 6 & 11
<u>Assignment 1</u>	20%	weeks 5 & 7
<u>Assignment 2</u>	20%	weeks 9 & 12
<u>Final Examination</u>	30%	During Exam period

Weekly

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 submit your solution electronically (in the form of a pdf file) before the deadline (usually 11:00 am every Friday). 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.

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 6 & 11**

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.

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 6-9pm, weeks 31--37 and 40 and 42--45, [C5A 304 Tutorial Room](#) (notice that Monday week 41 is Labour day and there is no lecture that week).
- 11 workshop: Tuesday 5-7pm, weeks 31--36 and 40 and 42--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] T. H. Cormen, C. E. Leiserson, R. L. Rivest, & C. Stein, Introduction to Algorithms (MIT Press) 3rd edition. ISBN 0-262-53305-7.
- [2] S. S. Skiena, The Algorithm Design Manual, Springer, 2nd edition, 2008, ISBN: 978-1-84800-069-8.

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

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

Technology

Object-oriented technology & languages: Java

In the second half of the course, the software GP-PARI will be used. It can be downloaded from <http://pari.math.u-bordeaux.fr/>

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.

Unit Schedule

Week	Topic	Reading
1	Elementary Algorithmics and Data Structures	Chaps. 1-2 in [1]
2	Analysis of Algorithms and Asymptotic Notations	Chaps. 3-4 in [1]
3	Greedy Algorithms	Chap 16 in [1]
4	Dynamic Programming	Chap 15 in [1]
5	Algorithm design techniques	Chaps. 4 and selected topics from chaps 6-9.
6	Computational Complexity 1	Chap 17 in [1]
7	Introduction to Number Theory	
	Recess 14-25 September	
8	Labour day, no lecture and no workshop	
9	Arithmetic Algorithms	
10	Factorisation	

11	Probabilistic Algorithms	
12	Efficiency and Computational Complexity 2	
13	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

Assessment Policy <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy <http://mq.edu.au/policy/docs/grading/policy.html>

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

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.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://informatics.mq.edu.au/help/>.

When using the University's IT, you must adhere to the [Acceptable Use 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
- 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
- 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

There will be no portfolio but two in-class tests during the semester will be used to assess the understanding of the weekly exercises following feedback of the submitted problems.

Grading

Grading

At the end of the session, you will receive a grade that reflects your achievement in the unit.

You will **pass** the unit if you

- obtain a total mark of 50% or higher; and
- pass both assignments; and
- pass the two in class-tests and final examination combined, i.e. obtained an average mark of at least 25 out of 50.

Students who do not meet this cut-off will be examined on a case-by-case basis.

In order to obtain a higher grade than a Pass, you must satisfy the conditions of a Pass and obtain:

- a total mark of 85% or higher for **High Distinction**;
- a total mark of 75% or higher for **Distinction**;
- a total mark of 65% or higher for **Credit**.