



COMP333

Algorithm Theory and Design

S2 Day 2014

Computing

Contents

<u>General Information</u>	2
<u>Learning Outcomes</u>	3
<u>Assessment Tasks</u>	3
<u>Delivery and Resources</u>	5
<u>Unit Schedule</u>	6
<u>Policies and Procedures</u>	6
<u>Graduate Capabilities</u>	8
<u>Changes from Previous Offering</u>	11
<u>Grading</u>	12

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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>In class tests</u>	10%	Weeks 6 & 10
<u>Assignment 1</u>	20%	weeks 5 & 7
<u>Assignment 2</u>	20%	weeks 9 & 12
<u>Portfolio</u>	10%	Week 13
<u>Final Examination</u>	40%	During Exam period

In class tests

Due: **Weeks 6 & 10**

Weighting: **10%**

In class tests will assess the understanding of the course material. Questions in the tests will be closely based on a selection of the submitted weekly exercises (see below).

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 tutorial 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.

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 IT 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 IT 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

Portfolio

Due: **Week 13**

Weighting: **10%**

This assessment task requires students to select from the weekly workshop problems and describe how they relate to the course material.

On successful completion you will be able to:

- Communicate clearly and effectively
- Work collaboratively in small teams

Final Examination

Due: **During Exam period**

Weighting: **40%**

The final examination will be a three-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](#).

Please note that **Workshops commence in Week 2** 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 (see the [rule](#)).

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

Textbook

The textbook for COMP333 used this semester is:

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

It is available from the University Co-op Bookshop.

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

C++ or Java compiler

Bitbucket version control

Websites

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

The textbook comes with a [companion website](#) provided by the publisher. This site contains chapter overviews, a glossary, algorithms written in pseudo-code, and more.

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
2	Analysis of Algorithms and Asymptotic Notations	Chaps. 3-4
3	Greedy Algorithms	Chap 16
4	Dynamic Programming	Chap 15
5	Algorithm design techniques	Chaps. 4 and selected topics from chaps 6-9.
6	Computational Complexity 1	Chap 17
7	Approximation Algorithms	Chap. 35
8	Probabilistic Algorithms	Chaps. 1 and 5
9	Metaheuristics	notes
10	Advanced Data Structures	Chap. 18-21
11	Parameterized Algorithms	notes
12	Computational Complexity 2	Chap. 34
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/

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

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 tasks

- In class tests
- Portfolio

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

- 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
- Portfolio
- 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

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

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

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
- Portfolio
- 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 two in-class tests during the semester to complement learning in the workshops. In-class tests are used to assess the understanding of the weekly exercises following feedback of

the submitted problems. The portfolio assessment is designed to encourage reflective practice and to give students the opportunity to demonstrate deep knowledge and awareness of the applications of the COMP333 material. The second part of the lecture material for the unit has been updated to integrate recent advances in the field.

Grading

Grading

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

- **Fail (F)**: does not provide evidence of attainment of all learning outcomes. There is missing or partial or superficial or faulty understanding and application of the fundamental concepts in the field of study; and incomplete, confusing or lacking communication of ideas in ways that give little attention to the conventions of the discipline.
- **Pass (P)**: provides sufficient evidence of the achievement of learning outcomes. There is demonstration of understanding and application of fundamental concepts of the field of study; and communication of information and ideas adequately in terms of the conventions of the discipline. The learning attainment is considered satisfactory or adequate or competent or capable in relation to the specified outcomes.
- **Credit (Cr)**: provides evidence of learning that goes beyond replication of content knowledge or skills relevant to the learning outcomes. There is demonstration of substantial understanding of fundamental concepts in the field of study and the ability to apply these concepts in a variety of contexts; plus communication of ideas fluently and clearly in terms of the conventions of the discipline.
- **Distinction (D)**: provides evidence of integration and evaluation of critical ideas, principles and theories, distinctive insight and ability in applying relevant skills and concepts in relation to learning outcomes. There is demonstration of frequent originality in defining and analysing issues or problems and providing solutions; and the use of means of communication appropriate to the discipline and the audience.
- **High Distinction (HD)**: provides consistent evidence of deep and critical understanding in relation to the learning outcomes. There is substantial originality and insight in identifying, generating and communicating competing arguments, perspectives or problem solving approaches; critical evaluation of problems, their solutions and their implications; creativity in application.

In this unit, your final grade depends on your performance in each part of the assessment. For each task, a mark is awarded based on your performance in each learning outcome assessed and their relative weights. The different component marks are then added up to determine your total mark out of 100. Your grade then depends on this total mark and your overall standards of

performance.

You will **pass** the unit if you

- obtain a total mark of 50% or higher; and
- demonstrate that you can perform at a Functional level or higher for each criterion assessed in the assignments; and
- reach a Functional level or higher for each criterion assessed in the final examination.

In order to obtain a higher grade than a Pass, you have to fulfill additional conditions. Namely, you must demonstrate that you can apply your knowledge consistently

- at an Advanced level and have a total mark of 85% or higher to obtain **High Distinction**;
- at least at a Proficient level and have a total mark of 75% or higher to obtain **Distinction**;
- at least at a Proficient level and have a total mark of 65% or higher to obtain **Credit**.