



COMP7000

Advanced Algorithms

Session 1, In person-scheduled-weekday, North Ryde 2022

School of Computing

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General Information

Unit convenor and teaching staff

Convenor

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Lecturer

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Credit points

10

Prerequisites

Admission to MRes

Corequisites

Co-badged status

Unit description

Algorithms are the essence of computer science. In this unit we build on the undergraduate understanding of algorithms and look at interesting and useful algorithms, both fundamental and cutting edge. The particular material covered will depend on the cohort but may include topics such as approximation algorithms, exponential-time exact and parameterized algorithms, linear and constraint programming and fundamental graph algorithms such as max-flow algorithms, matching algorithms and so on. The unit will also employ appropriate tools from complexity theory to analyse the performance of the algorithms studied.

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:

ULO1: Explain key ideas in the field of algorithmics and the workings of key algorithms, and compare and evaluate algorithmic solutions for computational problems.

ULO2: Formally analyse algorithms.

ULO3: Implement key algorithms.

ULO4: Develop algorithmic solutions for computational problems by constructing new

algorithms and combining existing algorithms.

ULO5: Investigate topics in advanced algorithms and synthesise the output for presentation in oral and written form.

General Assessment Information

COMP7000 will be assessed and graded according to the University assessment and grading policies.

Submission Deadlines

Late submissions **will be accepted but will incur a penalty** unless there is an approved Special Consideration request. A 12-hour grace period will be given after which the following deductions will be applied to the awarded assessment mark: 12 to 24 hours late = 10% deduction; for each day thereafter, an additional 10% per day or part thereof will be applied until five days beyond the due date. After this time, a mark of zero (0) will be given. For example, an assessment worth 20% is due 5 pm on 1 January. Student A submits the assessment at 1 pm, 3 January. The assessment received a mark of 15/20. A 20% deduction is then applied to the mark of 15, resulting in the loss of three (3) marks. Student A is then awarded a final mark of 12/20.

Standards

The following general standards of achievement will be used to assess each of the assessment tasks with respect to the letter grades.

Pass: Has a basic understanding of the algorithms and concepts as discussed in class. Can describe and reproduce definitions and fundamental algorithms. Can perform a basic research investigation in the area and present the results of that research in rudimentary written and oral forms.

Credit: As for Pass plus: Is able to apply the algorithmic techniques we have discussed to derive solutions to computational problems. Can develop, generalise and apply the concepts discussed in class to address basic theoretical and practical questions, and can effectively communicate these insights. Shows more than basic insights into the results of a research investigation and is able to communicate those insights.

Distinction/High Distinction: As for Credit plus: Is able to generalise and synthesise knowledge to address more complex topics beyond the material discussed in class. Can critically evaluate the limits of the techniques and algorithms discussed.

Assessment Process

These assessment standards will be used to give a numeric mark out of 100 to each assessment submission during marking. The mark will correspond to a letter grade for that task according to the University guidelines. The final raw mark for the unit will be calculated by combining the marks for all assessment tasks according to the percentage weightings shown in the assessment summary.

Assessment Tasks

Name	Weighting	Hurdle	Due
<u>Projects</u>	54%	No	Weeks 1 -- 12
<u>Presentation</u>	10%	No	Week 12-13
<u>Weekly tasks</u>	36%	No	Weeks 1--12

Projects

Assessment Type ¹: Project

Indicative Time on Task ²: 40 hours

Due: **Weeks 1 -- 12**

Weighting: **54%**

Students will be asked to complete 4 projects. These will consist of a combination of programming, program analysis and report writing.

On successful completion you will be able to:

- Explain key ideas in the field of algorithmics and the workings of key algorithms, and compare and evaluate algorithmic solutions for computational problems.
- Formally analyse algorithms.
- Implement key algorithms.
- Develop algorithmic solutions for computational problems by constructing new algorithms and combining existing algorithms.

Presentation

Assessment Type ¹: Presentation

Indicative Time on Task ²: 10 hours

Due: **Week 12-13**

Weighting: **10%**

An oral presentation supported by appropriate presentation materials.

On successful completion you will be able to:

- Explain key ideas in the field of algorithmics and the workings of key algorithms, and compare and evaluate algorithmic solutions for computational problems.
- Investigate topics in advanced algorithms and synthesise the output for presentation in oral and written form.

Weekly tasks

Assessment Type ¹: Problem set

Indicative Time on Task ²: 0 hours

Due: **Weeks 1--12**

Weighting: **36%**

Each week students will be asked to complete some exercises to test their understanding of the material.

On successful completion you will be able to:

- Explain key ideas in the field of algorithmics and the workings of key algorithms, and compare and evaluate algorithmic solutions for computational problems.
- Formally analyse algorithms.
- Implement key algorithms.
- Develop algorithmic solutions for computational problems by constructing new algorithms and combining existing algorithms.
- Investigate topics in advanced algorithms and synthesise the output for presentation in oral and written form.

¹ If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Writing Centre](#) for academic skills support.

² Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

Classes

Each week has two hours of face-to-face class. These classes will be a mixture lecture material, discussion and in class tests.

Recommended Reading and References

There is no set text for the course, but the following *far from exhaustive* list of texts may be useful for reference, study and further reading:

- Skiena, Algorithm Design Manual, Springer.
- Cormen, Leiserson, Rivest and Stein. Introductions to algorithms, Prentice Hall.
- Papadimitriou, Computational Complexity, Addison Wesley.
- Sipser, Introduction to the Theory of Computation, Thomson.

Unit Webpage, Materials and Technologies Used

The materials for the unit including notes, discussion fora, electronic submission links etc. will be through the iLearn system.

The programming projects can be done in any programming language subject to prior approval of the course convener. Languages can include Java and Python.

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Assessment Procedure](#)
- [Complaints Resolution Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

Students seeking more policy resources can visit [Student Policies \(https://students.mq.edu.au/support/study/policies\)](https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au) and use the [search tool](#).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/student-conduct>

Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) 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 or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

Student Support

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

The Writing Centre

[The Writing Centre](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Workshops](#)
- [Chat with a WriteWISE peer writing leader](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

Student Services and Support

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study
- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support including information about finances, tenancy and legal issues](#)

Student Enquiries

Got a question? Ask us via [AskMQ](#), or contact [Service Connect](#).

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.