COMP7000

Advanced Algorithms

Session 1, Special circumstances 2021

School of Computing

Contents

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Notice

As part of Phase 3 of our return to campus plan, most units will now run tutorials, seminars and other small group activities on campus, and most will keep an online version available to those students unable to return or those who choose to continue their studies online.

To check the availability of face-to-face activities for your unit, please go to timetable viewer. To check detailed information on unit assessments visit your unit's iLearn space or consult your unit convenor.

General Information

Unit convenor and teaching staff Convenor Annabelle McIver annabelle.mciver@mq.edu.au
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 an 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

Assessment deadlines are strict, unless an application for special consideration is received (preferably in advance) accompanied by appropriate documentary evidence. Late submissions will be penalised at the rate of 20% of the full marks for the assessment per day or part thereof late.

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
Weekly tasks	36%	No	Weeks 1 -- 12
Projects	54%	No	Weeks 3 -- 12
Presentation	10%	No	Weeks 12--13

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.

Projects

Assessment Type [1]: Project
Indicative Time on Task [2]: 40 hours
Due: **Weeks 3 -- 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: **Weeks 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.

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[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, Spinger.
- 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). 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
- Grade Appeal Policy
- Complaint Management 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). 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) 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

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 help you improve your marks and take control of your study.

- Getting help with your assignment
- Workshops
- StudyWise
- 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

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

If you are a Global MBA student contact globalmba.support@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.