MONASH University
Information Technology

FIT1029
Algorithmic problem solving

Unit Guide

Semester 1, 2015

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Table of Contents

FIT1029 Algorithmic problem solving - Semester 1, 2015

Algorithms are recipes for solving a problem. They are fundamental to computer science and software engineering. Algorithms are the formal foundation of computer programming but also exist independently of computers as systematic problem-solving procedures. This unit introduces algorithmics, the study of algorithms. It is not about programming and coding but rather about understanding and analysing algorithms and about algorithmic problem-solving, i.e. the design of systematic problem-solving procedures. The unit will not require any knowledge of a programming language and is very hands-on. Students will develop algorithms to solve a wide variety of different problems, working individually as well as together in groups and as a class.

Topics include: What is a computational problem and what is an algorithm; basic control structures; basic data structures; modular algorithm structure; recursion; problem-solving strategies for algorithm development; understanding the efficiency of an algorithm; and limitations of algorithms.

Mode of Delivery

- Clayton (Day)
- Malaysia (Day)

Workload Requirements

Minimum total expected workload equals 12 hours per week comprising:

(a.) Contact hours for on-campus students:

- Two hours of lectures
- One 2-hour tutorial

(b.) Additional requirements (all students):

- A minimum of 2-3 hours of personal study per one hour of contact time in order to satisfy the reading and assignment expectations.

See also Unit timetable information

Chief Examiner

Dr Julian Garcia

Campus Lecturer

Clayton

Dr Julian Garcia

Malaysia

Dr. Simon Egerton

Your feedback to Us

Monash is committed to excellence in education and regularly seeks feedback from students, employers and staff. One of the key formal ways students have to provide feedback is through the Student Evaluation of Teaching and Units (SETU) survey. The University's student evaluation policy requires that every unit is evaluated each year. Students are strongly encouraged to complete the surveys. The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied and areas for improvement.

For more information on Monash's educational strategy, see:

www.monash.edu.au/about/monash-directions/ and on student evaluations, see:
www.policy.monash.edu/policy-bank/academic/education/quality/student-evaluation-policy.html

Previous Student Evaluations of this Unit

This unit was first offered in 2010 and in Semester 1, 2012, some of those students were taking third year units. Evidence gathered over the years indicates that the introduction of FIT1029 has helped to improve the students' programming skills and improved the pass rates in core BCS and BSE units.

Feedback from students who have taken FIT1029 and have gone on to later year studies in the BCS and the BSE indicates that students feel that FIT1029 has helped them gain a better appreciation of algorithms, and to regard thinking about algorithms as an activity that should be kept separated from coding algorithms into a particular computer programming language.

If you wish to view how previous students rated this unit, please go to
https://emuapps.monash.edu.au/unitevaluations/index.jsp

Academic Overview

Learning Outcomes

At the successful completion of this unit, students should be able to:

1. describe an algorithm consisting of basic structures (sequence, choice, iteration, modules) at the level of detail required for a particular audience;
2. demonstrate how basic data structures (list, graphs, trees, sets, tables) function;
3. create simple recursive and iterative algorithms;
4. evaluate different possible strategies for developing an algorithm and be able to select an appropriate one to solve a given problem;
5. apply standard patterns to develop algorithms;
6. break problems down into simpler problems;
7. determine the complexity of simple algorithms;
8. recognise the limitations of algorithms.

Unit Schedule

Week	Activities	Assessment
0		No formal assessment or activities are undertaken in week 0
1	Introduction to the unit, algorithms and data structures.	Student participation will be assessed during every lecture or tutorial
2	Describing and finding algorithms.	
3	Invariance and greedy approach.	
4	Applying Brute Force to solve problems.	Assignment 1 due
5	Decomposition.	
6	Decrease and conquer.	Test during lecture
7	Transform and conquer; and divide and conquer.	
8	Recursion and backtracking.	
9	Dynamic Programming.	
10	Complexity.	Assignment 2 due
11	Limitations of algorithms.	
12	Strategies for finding algorithms.	
	SWOT VAC	No formal assessment is undertaken in SWOT VAC
	Examination period	LINK to Assessment Policy: http://policy.monash.edu.au/policy-bank/academic/education/assessment/assessment-in-coursework-policy.html

*Unit Schedule details will be maintained and communicated to you via your learning system.

Teaching Approach

- **Lecture and tutorials or problem classes**
  This teaching and learning approach helps students to initially encounter information at lectures, and discuss and explore the information during tutorials.
- **Problem-based learning**
  Students will be presented with information and guided on how to best find solutions for a given problem.

Assessment Summary

Examination (3 hours): 60%; In-semester assessment: 40%

Assessment Task	Value	Due Date
Assignment 1	10%	Week 4
Test	15%	Week 6 during lecture
Assignment 2	10%	Week 10

Unit Schedule

Student participation	5%	Every lecture or tutorial
Examination 1	60%	To be advised

Assessment Requirements

Assessment Policy

Faculty Policy - Unit Assessment Hurdles
(http://intranet.monash.edu.au/infotech/resources/staff/edgov/policies/assessment-examinations/assessment-hurd

Academic Integrity - Please see resources and tutorials at
http://www.monash.edu/library/skills/resources/tutorials/academic-integrity/

Assessment Tasks

Participation

- **Assessment task 1**

  Title:
  Assignment 1
  Description:
  This assignment is a series of questions that will aim to help you understand how to go about finding algorithms to solve problems
  Weighting:
  10%
  Criteria for assessment:
  Detailed assessment criteria will be issued along with the assignment.

  1. All assumptions should be stated.
  2. All algorithms must meet the problem specification.
  3. Students should be able to answer questions about their own work.

  Due date:
  Week 4

- **Assessment task 2**

  Title:
  Test
  Description:
  This test will be based on the first 4 weeks of material.
  Weighting:
  15%
  Criteria for assessment:
  This test will evaluate:

  1. Your understanding of the material provided during the first few weeks of semester.
  2. Your capability to write simple algorithms in pseudo code given a clear specification.
  3. Your ability to demonstrate an understanding of some basic data structures.
  4. Your ablility to analyse the behaviour of simple algorithms.

  Due date:
  Week 6 during lecture

- **Assessment task 3**

Title:
Assignment 2
Description:
This assignment will help you understand different strategies for finding algorithms.
Weighting:
10%
Criteria for assessment:
Detailed assessment criteria will be issued along with the assignment.

1. All assumptions should be stated.
2. All algorithms must meet the problem specification.
3. Students should be able to answer questions about their own work.

Due date:
Week 10

- **Assessment task 4**

Title:
Student participation
Description:
Student participation during either lectures or tutorials.
Weighting:
5%
Criteria for assessment:
A grade will be based on a student's participation in lectures or tutorials.
Due date:
Every lecture or tutorial

Examinations

- **Examination 1**

Weighting:
60%
Length:
3 hours
Type (open/closed book):
Closed book
Electronic devices allowed in the exam:
None

Learning resources

Reading list

Levitin, A. (2007). *Introduction to the Design and Analysis of Algorithms*. (2nd Edition) Addison-Wesley.

Monash Library Unit Reading List (if applicable to the unit)
http://readinglists.lib.monash.edu/index.html

Feedback to you

Types of feedback you can expect to receive in this unit are:

- Informal feedback on progress in labs/tutes
- Graded assignments with comments
- Test results and feedback

Extensions and penalties

Submission must be made by the due date otherwise penalties will be enforced.

You must negotiate any extensions formally with your campus unit leader via the in-semester special consideration process: http://www.monash.edu.au/exams/special-consideration.html

Returning assignments

Students can expect assignments to be returned within two weeks of the submission date or after receipt, whichever is later.

Assignment submission

It is a University requirement (http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-academic-integrity-managing-pla for students to submit an assignment coversheet for each assessment item. Faculty Assignment coversheets can be found at http://www.infotech.monash.edu.au/resources/student/forms/. Please check with your Lecturer on the submission method for your assignment coversheet (e.g. attach a file to the online assignment submission, hand-in a hard copy, or use an electronic submission). Please note that it is your responsibility to retain copies of your assessments.

Online submission

If Electronic Submission has been approved for your unit, please submit your work via the learning system for this unit, which you can access via links in the my.monash portal.

Recommended text(s)

Levitin, A. (2007). *Introduction to the Design and Analysis of Algorithms*. (2nd Edition) Addison-Wesley.

Additional subject costs

Clayton students are required to purchase a Turning Point clicker from the Campus Bookstore or directly from the Australian Distributor. More information about clickers can be found on this webpage: http://intranet.monash.edu.au/infotech/resources/students/enrolment/clickers.html.

Other Information

Policies

Monash has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University's academic standards, and to provide advice on how they might uphold them. You can find Monash's Education Policies at:
www.policy.monash.edu.au/policy-bank/academic/education/index.html

Faculty resources and policies

Important student resources including Faculty policies are located at
http://intranet.monash.edu.au/infotech/resources/students/

Graduate Attributes Policy

http://www.policy.monash.edu/policy-bank/academic/education/management/monash-graduate-attributes-policy.h

Student Charter

www.opq.monash.edu.au/ep/student-charter/monash-university-student-charter.html

Student services

The University provides many different kinds of support services for you. Contact your tutor if you need advice and see the range of services available at http://www.monash.edu.au/students. For Malaysia see http://www.monash.edu.my/Student-services, and for South Africa see http://www.monash.ac.za/current/.

Monash University Library

The Monash University Library provides a range of services, resources and programs that enable you to save time and be more effective in your learning and research. Go to www.lib.monash.edu.au or the library tab in my.monash portal for more information. At Malaysia, visit the Library and Learning Commons at http://www.lib.monash.edu.my/. At South Africa visit http://www.lib.monash.ac.za/.

Disability Liaison Unit

Students who have a disability or medical condition are welcome to contact the Disability Liaison Unit to discuss academic support services. Disability Liaison Officers (DLOs) visit all Victorian campuses on a regular basis.

- Website: http://www.monash.edu/equity-diversity/disability/index.html
- Telephone: 03 9905 5704 to book an appointment with a DLO; or contact the Student Advisor, Student Commuity Services at 03 55146018 at Malaysia
- Email: dlu@monash.edu
- Drop In: Equity and Diversity Centre, Level 1, Building 55, Clayton Campus, or Student Community Services Department, Level 2, Building 2, Monash University, Malaysia Campus

Other

Engineers Australia Stage 1 competencies

This unit is a core unit in the Bachelor of Software Engineering accredited by Engineers Australia. Engineers Australia Accreditation Policy of Professional Engineering Programs requires that programs demonstrate how engineering graduates are prepared for entry to the profession and achieve Stage 1 competencies. The following information describes how this unit contributes to the development of these competencies for the Bachelor of Software Engineering. (Note: not all competencies may be emphasised in this unit).

Stage 1 competency	**How the compency is developed in this unit**
1. Knowledge and Skills base	
1.1. **Comprehension, theory based understanding** of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.	This is covered in lecture notes, practical exercises and assignments.
1.2. **Conceptual understanding** of the mathematics, numerical analysis, statistics, and computer and information sciences, which underpin the engineering discipline.	This is covered in all assessment components.
1.3. **In-depth understanding** of specialist bodies of knowledge within the engineering discipline.	Not covered in this unit.
1.4. **Discernment** of knowledge development and research directions within th engineering discipline.	Not covered in this unit.
1.5. **Knowledge** of engineering design practice and contextual factors impacting the engineering discipline.	Not covered in this unit.
1.6. **Understanding** of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline.	Not covered in this unit.
2. Engineering application ability	
2.1. **Application** of established engineering methods to complex engineering problem solving.	Not covered in this unit.
2.2 **Fluent application** of engineering techniques, tools and resources.	Not covered in this unit.
2.3. **Application** of systematic engineering synthesis and design processes.	Not covered in this unit.
2.4. **Application** of systematic approaches to the conduct and management of engineering projects.	Not covered in this unit.
3. Professional and personal attributes	
3.1. **Ethical** conduct and professional accountability.	Not covered in this unit.
3.2. **Effective** oral and written communication in professional and lay domains.	Students have to express themselves clearly and effectively for their assessment components of the unit.
3.3. **Creative**, innovative and proactive demeanour.	Some creativity is encouraged to develop solutions for the assessment components.
3.4. **Professional** use and management of information.	Not covered in this unit.
3.5. **Orderly** management of self, and professional conduct.	

	This is covered in the unit through the delivery of solutions to exercises and assignments.
3.6. **Effective** team membership and team leadership.	Not covered in this unit.

Relationship between Unit Learning Outcomes and BSE Course Outcomes

No.	CO 1	CO 2	CO 3	CO 4	CO 5	CO 6	CO 7	C0 8	CO 9	CO 10	CO 11	CO 12	CO 13
1	X	X						X					
2	X	X											
3	X	X											
4	X	X	X										
5	X	X	X										
6	X	X	X		X								
7	X	X	X		X								
8	X	X	X		X	X							

Relationship between Unit Learning Outcomes and Assessments

No.	Assignments	Tests	Practical	Exercises	Exam
1	X	X	X		X
2	X	X	X		X
3	X		X		X
4	X		X		X
5	X	X	X		X
6	X		X		X
7	X	X	X		X
8	X		X		X