159201

Algorithms and Data Structures

Course and Assessment Guide

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Computer Science
INMS

S1 - 2022

Prescription

An introduction to the analysis and implementation of algorithms and data structures including abstract data types, linear data structures, trees, graphs, hash tables, searching algorithms, sorting algorithms, optimisation problems and complexity analysis. The course includes a significant practical component covering the implementation and application of important data structures and algorithms.

Pre/co-requisites

Prerequisite(s):159.102
General Prerequisite: At least 45 credits from 100 level.
Restriction(s):159.271

Learning outcomes

Students who successfully complete this course should be able to:
1. Design, select and implement key data structures in C++.
2. Implement algorithms using these data structures to solve practical problem scenarios.
3. Analyze, compare and classify algorithms.
4. Using their asymptotic complexity, select appropriate algorithms in order to implement solutions that are efficient.
5. Develop strategies to implement approximate solutions for intractable problems.

Please note: Learning Outcomes are subject to change until the beginning of the semester in which the course is delivered.

Study resources

Recommended Reading

- 159201 study guide (available on Stream as a single pdf file)
- Data Structures and Algorithms in C++ by Adam Drozdek, Thompson (any edition). e.g. ISBN 0-534-49182-0

Stream: Your online learning environment

Stream contains material that can be downloaded to your private computer:

- The study guide (pdf)
- The slides (pdf) and a printable version of the slides in 6 slides per page (pdf).
- Sample codes in C and C++ that can be used as supplementary material for the exercises, assignments and tutorials.
- The assignment proposals, sample code that can be used as a starting point for each assignment, and input examples for you to test your assignment solution.
- Links to useful web sites (such as a C++ tutorial and reference material, virtual machine to test your assignment codes etc).

Contacting your lecturer:

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How to approach your study

Each week covers a specific set of data structures and/or algorithms. You benefit if you do:

- Attend online lectures and tutorials.
- Read the study guide chapters that refer to the topics presented on that week.
- Complete the assignments on time. The tutorials contain important clues that help with the completion of the assignments. Use the virtual machine to test your assignment code. You can repeat the tests until your code passes them all.
- Try to memorise the concepts of each data structure and the mechanism behind their related algorithms. Try re-writing code without looking at the examples, then check your code against the examples and correct them when necessary. It is very important to code, compile, debug and run your own programs.

Suggested study schedule

This is a 15 credit paper. The following table gives an idea of how to allocate your study time. Although the workload varies a little from week to week, you should allocate about 12.5 hours per week over the semester. If you are aiming for an A pass you may need to spend more time.

Reading the corresponding chapters on the study guide	36 hours
Tutorial preparation and exercises (including coding)	30 hours
Contact hours (lectures and tutorials)	48 hours
Assignments	36 hours
TOTAL	**150 hours**

Semester 1 2022 **Topics**

Date (start)	**Weeks**	**Topic**	**OBS:**
1 March	1	C/C++ types and pointers revision, linked-lists.	
8 March	2	Stacks.	
15 March	3	Queues.	
22 March	4	Vectors and Lists.	
29 March	5	General trees, Binary trees.	
5 April	6	Arithmetic trees, Binary Search trees.	
	MID SEMESTER BREAK		
26 April	7	Heaps, AVL trees, Threaded trees, Sets/Bags.	
31 April	8	Graphs, Kruskal, Dijkstra.	
3 May	9	Sorting algorithms (part 1).	
10 May	10	Sorting algorithms (part 2).	
17 May	11	Searching algorithms, Hashing.	
24 May	12	Travelling Salesman Problem, special topics.	
	STUDY BREAK		
13 – 23 June	EXAMS		

Assessment

Assessment Description	Learning Outcomes Assessed					Contribution to Course Marks
	1	2	3	4	5	
Assignments	✔	✔	✔	✔	✔	40.00%
Mid-semester Test	✔		✔	✔		20.00%
Final Examination	✔	✔	✔	✔	✔	40.00%

Assessment Schedule

Assessment	Due Date / Deadline	Late Penalty	Course completion requirement	percentage
Assignment 1	18/March (Fri)	-10% per day	n/a	40
Assignment 2	25/March (Fri)	-10% per day	n/a	
Assignment 3	1/April (Fri)	-10% per day	n/a	
Assignment 4	8/April (Fri)	-10% per day	n/a	
Assignment 5	6/May (Fri)	-10% per day	n/a	
Assignment 6	20/May (Fri)	-10% per day	n/a	
Assignment 7	3/Jun (Fri)	-10% per day	n/a	
Mid-semester Test	**6/April (Wed)**		**compulsory**	20
Final Exam	**(exam timetable)**		**compulsory**	40

Requirements for completing the paper

To complete this paper you will need to attend the mid-semester Test and the Final Exam (both are compulsory). You also need to achieve an average value of at least 50% of the sum of the assessment items.

Assignment submission

Assignments have to be submitted on the due date, if submitted late there is a 10% a day penalty.

Assignments can be checked automatically using a virtual machine. The lecturer will explain how this process works and inform your user/password to use the system.

Academic integrity

It is mandatory that any assessment items that you submit during your University study are your own work. Massey University takes a firm stance on academic misconduct, such as plagiarism and any form of cheating.

> Plagiarism is the copying or paraphrasing of another person's work, whether published or unpublished, without clearly acknowledging it. It includes copying the work of other students and reusing work previously submitted by yourself for another paper.

Plagiarism, and cheating in tests and exams will be penalised; it is likely to lead to loss of marks for that item of assessment and may lead to an automatic failing grade for the paper and/or exclusion from reenrolment at the University.

Please see the *Academic Integrity Guide for Students* on the University website for more information. The Guide steps you through the University Academic Integrity Policy and Procedures. For example you will find definitions of academic integrity misconduct, such as plagiarism; how misconduct is determined and managed; and where to find resources and assistance to help develop the skills of academic writing, exam preparation and time management. These skills will help you approach university study with academic integrity.

Conditions for aegrotat pass and impaired performance

If you are prevented by illness, injury or serious crisis from attending a compulsory learning experience, an examination or completing an element of assessment (worth 10% or more) by the due date, or if you consider that your performance has been seriously impaired by such circumstances, you may apply for aegrotat or impaired performance consideration. You must apply on the Aegrotat & Impaired Performance Application form available from the Massey University website. The completed form must be accompanied by a certificate signed by a health professional, and/or corroborating evidence.

Queries about final grades

Each qualification is managed by a Programme Committee and the Chair of the Programme Committee, the Programme Director/Leader, is the chief examiner for that qualification. Although each Paper Coordinator is the examiner for the paper they

coordinate, overall responsibility is with the Programme Director. The Programme Director/Leader ensures the processes have been followed, but accomplishes this through the examinations section of our Student Administration Unit. If you are not happy with the grade you are given, then you should, in the first instance, contact Student Administration about that. They will then ensure your complaint is followed up and a response provided.

Grievance procedures

A student who claims that he/she has sustained academic disadvantage as a result of the actions of a University staff member should use the University Grievance Procedures. Students, whenever practicable, should in the first instance approach the University staff member concerned. If the grievance is unresolved with the staff member concerned, the student should then contact the relevant Head of Institute/School/Department or College office for further information on the procedures. The procedures can be found on the University website in the University Calendar.