



Module Specification

Key Information			
Module title	Algorithms and Data Structures 2		
Level	5	Credit value	15
Member Institution	Goldsmiths	Notional study hours and duration of course	150
Module lead author/ Subject matter expert			
Module co-author			

Rationale for the module
<p>Algorithms and data structures are critical elements of the body of knowledge of computer science. Knowledge of a range of algorithms and data structures will allow you to solve common programming problems more rapidly. Within the programme, this module builds on the knowledge and skills gained in Algorithms and Data Structures 1. You will be exposed to more complicated data structures than those you have encountered before and will learn algorithms for manipulating them. The skills you gain will allow you to develop more advanced software that solves more difficult problems as you encounter them later in the programme.</p>

Aims of the module
<p>This module aims to provide you with detailed knowledge of several common algorithms and data structures. You will improve your understanding of searching and sorting and learn new algorithms to solve new problems. You will learn about a range of data structures such as trees, heaps, sets, maps, stacks, queues and graphs. You will learn how to evaluate and describe the performance of algorithms using big-O notation. You will learn: how to choose appropriate data structures for representing problems, how to define and implement algorithms for manipulating them, and how to analyse the correctness and efficiency of algorithms.</p> <p>You will be expected to have mastered the material in Algorithms and Data Structures I before attempting this module.</p>

Topics covered in this module:

The topics listed here are an approximation of what will be covered. The topics presented may be slightly revised to ensure currency and relevance. Students will be advised of any changes in advance of their study.

1. Analysis of algorithms
2. Recursive algorithms
3. Comparison sorting algorithms
4. Non-comparison sorting algorithms
5. Hashing
6. Linked lists, stacks and queues
7. Linear data structures
8. Trees
9. Heaps
10. Graphs

Approximately 10-12 hours of study will be required per topic. The remaining study time is intended for coursework and examination preparation.

Learning outcomes for the module

Students who successfully complete this module will be able to:

1. Choose and justify appropriate data structures and algorithms to solve specific problems
2. Express time and space complexities of specific algorithms using big-O notation
3. Implement standard searching, sorting and path finding algorithms
4. Implement trees and hash tables, and describe the consequences of particular implementation choices
5. Compare and contrast recursive and iterative expressions of solutions to problems
6. Describe the abstraction of collections, relate this abstraction to linear collections, and recall the basic operations that each abstraction supports

Assessment strategy, assessment methods

Summative and Formative Assessments

The module will contain a range of summative and formative assessments. Summative assessments are assessments which contribute directly towards your final grade. Formative assessments do not count directly towards your final grade. Instead, they provide you with opportunities for low stakes practice, and will often provide some sort of feedback about your progress. For example, a practice quiz might provide you with feedback about why a particular answer was wrong.

This module includes regular auto-graded quizzes as formative assessment, encouraging you to engage and enabling you to gauge your progress.

Assessment Activities

The table below lists the assessment activity types you might encounter taking the module. It also states if that type of assessment can be automatically graded. For example, multiple choice quizzes can be automatically graded, and so can some programming assignments. It also states if that type of assessment will be found in the summative coursework and the summative examination. More details about the summative assessments are provided below.

Assessment activity type	Can it be automatically graded with feedback in some cases?	CW	Examination
Quiz	X	X	X
Writing task		X	X
Programming task	X	X	X

Pass Mark

In order to pass this module, you must achieve at least 35% in each element of summative assessment and an overall weighted average of 40%, subject to the application of rules for compensation. Please refer to the programme regulations for more information.

Summative Assessment Elements

As this is a module that has a significant amount of theory it is assessed as a theory-based module. This means that the summative assessment is composed of two elements, whose weightings are listed in the table below.

Summative Assessment Component	Percentage of final credit	Deadline
Coursework	50%	Mid session
Examination	50%	End of session

The coursework comprises a variety of practical exercises and quizzes which in total will take up to 25 hours of study time to complete. The examination will be two hours long, and consist of written answer and multiple choice questions.

Learning resources

The module will draw on a number of different, largely web-based, public resources as well as the resources produced as bespoke material for this module. The standard text book for the module will be:

Cormen, T.H., C.E. Leiserson, R.L. Rivest and C. Stein *Introduction to algorithms*. (MIT Press, 2009) 3rd edition [ISBN 9780262533058].

This link will take you to the ebook in the Online Library:

(<https://ebookcentral.proquest.com/lib/londonww/detail.action?docID=3339142>)