



Module Specification

Key Information			
Module title	Algorithms and Data Structures I		
Level	4	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
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 provides an introductory level treatment of algorithms and data structures in preparation for more advanced coverage later in the programme.

Aims of the module
This module aims to help you to develop your analytical and problem-solving skills, particularly concerning thinking algorithmically. The module will encourage you to start thinking about how to use computers to solve problems. You will develop skills in thinking algorithmically and learn the central concepts of algorithms and data structures. You will learn about linear data structures such as arrays, vectors and lists, and a unifying framework for considering such data structures as collections. You will learn how algorithms can be expressed as flowcharts and pseudocode, and how to convert these expressions into running programs. You will learn specific algorithms used for sorting and searching, and how to express repetition as iteration and recursion. You will learn a simple model for execution of computation, and how to describe computational problems and their solutions. The model will allow you to compare algorithms regarding their correctness and regarding their efficiency.

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. Problems, algorithms and flowcharts
2. Pseudocode
3. Vectors, stacks and queues
4. Data structures and searching
5. Sorting data 1
6. What makes a good algorithm?
7. Searching data 2
8. Recursion
9. Sorting data 2
10. Computational complexity

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. Convert from abstract descriptions of solutions to algorithmic descriptions
2. Convert algorithm descriptions from flowcharts or pseudo code into working program code
3. Describe, differentiate between and implement basic linear data structures such as arrays, lists and vectors
4. Compare the notional performance of algorithms for sorting and searching linear data
5. Describe the abstraction of linear collections, and recall and define the basic operations that these data structures support

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 will have a substantial number of automatically graded quizzes to help you gauge your learning.

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 courseworks 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:

Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. Introduction to Algorithms, Third Edition. The MIT Press, 2009.