Liverpool John Moores University

Title:	ADVANCED DATA STRUCTURES AND ALGORITHMS
Status:	Definitive
Code:	**6068COMP** (120642)
Version Start Date:	01-08-2019
Owning School/Faculty:	Computer Science
Teaching School/Faculty:	Computer Science

Team	Leader
Hoshang Kolivand	Y

Academic Level:	FHEQ6	**Credit Value:**	24	**Total Delivered Hours:**	74
Total Learning Hours:	240	**Private Study:**	166		

Delivery Options
Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	24
Practical	24
Seminar	24

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Examination	50	2
Artefacts	AS2	Algorithm Implementation and Data Modelling task	50	

Aims

Apply various computational techniques to solve many common problems.
Develop an understanding of key concepts of complexity theory and illustrate their relevance to practical problems of algorithm design.
Understand the difference between a tractable and intractable problem and apply the implications to practical situations.

Develop an appreciation of practical industrial applications of expert systems, constraint satisfaction and simulation.
Enhance the student's computer Science skills through practical implementation of theoretical ideas covered in the module.

Learning Outcomes

After completing the module the student should be able to:

1	Design algorithms and employ appropriate advanced data structures for solving computing problems efficiently.
2	Implement different algorithm paradigms in a high level programming language.
3	Analyse the time requirements of particular algorithmic solutions.
4	Apply appropriate algorithms to practical situations by taking into account tractable and intractable problems.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Examination	1	2
Algorithm Implementation	3	4

Outline Syllabus

Time complexity, the big-O notation.
Elementary data structures, hash tables, binary search trees, red-black trees.
Advanced data structures: B-trees, Binomial Heaps, Fibonacci Heaps.
Sorting algorithms: Sequential and parallel algorithms, comparison of performance
Algorithmic paradigms: Divide and conquer. Dynamic Programming, Greedy Method, and Backtracking.
Graph Algorithms
Tractable and intractable problems: P&NP problems, NP-complete problems.
Approximation algorithms
Autonomous systems
Constraint satisfaction
Planning
Scheduling
Expert systems and production rule systems
Use of simulation

Learning Activities

Lectures followed by tutor-led tutorial/practical sessions.

Notes

This module is intended to provide for the advanced design and analysis of algorithms. The emphasis is on solving computational problems that involve manipulating collections of data. It covers the modern theory of algorithms, focusing on the themes of efficient algorithms and intractable problems.
In the second half of this module these concepts will be utilized in solving various problems in a real world or industrial context. This will involve constraint satisfaction problems, the use of Expert Systems and other software solutions that are appropriate in an industrial process setting.