

## Module Information

2022.01, Approved

### Summary Information

Module Code	7128COMP
Formal Module Title	Advanced Data Structures and Algorithms
Owning School	Computer Science and Mathematics
Career	Postgraduate Taught
Credits	20
Academic level	FHEQ Level 7
Grading Schema	50

### Teaching Responsibility

LJMU Schools involved in Delivery
Computer Science and Mathematics

### Learning Methods

Learning Method Type	Hours
Lecture	12
Tutorial	24

### Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit
SEP-CTY	CTY	September	12 Weeks

### Aims and Outcomes

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.
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**After completing the module the student should be able to:**

**Learning Outcomes**

Code	Number	Description
MLO1	1	Design algorithms and employ appropriate advanced data structures for solving computing problems efficiently.
MLO2	2	Implement different algorithm paradigms in a high level programming language.
MLO3	3	Analyse the time requirements of particular algorithmic solutions.
MLO4	4	Apply appropriate algorithms to practical situations by taking into account of tractable and intractable problems.

**Module Content**

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
Module Overview	<p>This course covers the modern theory of algorithms, focusing on the themes of efficient algorithms and intractable problems. It aims to:</p> <ul style="list-style-type: none"> <li>apply various computational techniques to solve many common problems</li> <li>develop an understanding of key concepts of complexity theory and illustrate their relevance to practical problems of algorithm design</li> <li>understand the difference between a tractable and intractable problem and apply the implications to practical situations</li> </ul>
Additional Information	This course covers the modern theory of algorithms, focusing on the themes of efficient algorithms and intractable problems.

**Assessments**

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Technology	Algorithm implementation	40	0	MLO1, MLO2
Centralised Exam	Examination	60	2	MLO3, MLO4

**Module Contacts**

**Module Leader**

Contact Name	Applies to all offerings	Offerings
Somasundaram Ravindran	Yes	N/A

**Partner Module Team**

Contact Name	Applies to all offerings	Offerings
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