

Warning: An incomplete or missing proforma may have resulted from system verification processing

Title: Algorithms and Computing  
Status: Definitive  
Code: **3100CIT** (125320)  
Version Start Date: 01-08-2021  
  
Owning School/Faculty: Engineering  
Teaching School/Faculty: Changshu Institute of Technology

Team	Leader
Clifford Mayhew	Y

**Academic Level:** FHEQ3      **Credit Value:** 10      **Total Delivered Hours:** 66  
**Total Learning Hours:** 100      **Private Study:** 34

### Delivery Options

Course typically offered: Semester 2

Component	Contact Hours
Lecture	48
Practical	16

**Grading Basis:** 40 %

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Examination	60	2
Practice	AS2	Programming	30	
Report	AS3	Report	10	

### Aims

*This module aims to provide students with an introduction to technical computing and the application of computers in the implementation of simple algorithms. This is supported by a syllabus which covers the key elements of decision mathematics.*

- To introduce the student to the area of computer systems.
- To provide an understanding of the underlying computing platform (hardware, OS, network) upon which applications are developed and hosted.
- To introduce students the key elements of decision mathematics and simple algorithms.

## Learning Outcomes

After completing the module the student should be able to:

- 1 Discuss the basic concepts of the algorithm, the computational model and the typical algorithms.
- 2 Demonstrate the method of algorithm design, and develop the ability of algorithm design.
- 3 Discuss the main parts of software and the development trend of software technology.
- 4 Describe the fundamental principles of software design and development.

## Learning Outcomes of Assessments

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

Examination	1	2	3	4
Programming	2	3	4	
Report	3	4		

## Outline Syllabus

### 1. Module Overview and Introduction to Computing

- Introduction to Computer Architecture
- CPU Architecture and Multi-core CPUs
- Digital Communication - Buses
- Digital Communication - Networking

### 2. Fundamental principles of software

- Software - Loading and Execution
- Software - Multi-programming

### 3. Algorithm overview

- Basic concepts of algorithm, data structure and program
- Algorithm complexity analysis

### 4. Lists, Stacks and Queues

- Abstract Data Types (ADTs)
- The List ADT
- The Stack ADT

- *The Queue ADT*
- *Applications*

#### 5. *Trees*

- *Preliminaries*
- *Binary Trees*
- *Tree Traversals*
- *The Search Tree ADT: Binary Search Trees*
- *Applications*

#### 6. *Graph Algorithms*

- *Definitions*
- *Representation of Graphs*
- *Graph Traversals: Depth-First Search and Breadth-First Search Algorithm*
- *Topological Sort*
- *Shortest-Path Algorithms: Dijkstra's Algorithm and Floyd Algorithm*
- *Minimum Spanning Tree: Prim's Algorithm and Kruskal's Algorithm*
- *Applications*

#### 7. *Hashing*

- *General Idea*
- *Hash Function*
- *Separate Chaining*
- *Open Addressing*
- *Rehashing*
- *Applications*

#### 8. *Sorting Algorithm*

- *Preliminaries*
- *Insertion Sort: Straight Insertion Sort, Binary Insertion Sort, Shellsort*
- *Exchange Sort: Bubble Sort, Quicksort*
- *Selection Sort: Simple Selection Sort, Heapsort*
- *Mergesort*
- *Applications*

### **Learning Activities**

A series of lectures with some laboratory activities.

### **Notes**

The module introduces students the basic theory of algorithm and its application to electronics.