

Algorithms and Data Structures

Course Name: Algorithms and Data Structures.

Course Code: SFT206

Credit hours: 3

Knowledge Domain: Software Engineering.

Prerequisite(s): Programming Techniques (3) (SFT203)

Learning Objectives

Upon completion of this course, the student will be able to:

1. Acquire the basic definition, specification and performance of algorithms with a number of illustrative examples.
2. Construct the elements of Data structures with emphasis on graphs and trees.

Learning Outcomes

1. Grasping how to define the steps of an algorithm, together with evaluation of the time and memory resources needed.
2. Knowledge through some examples of using graphs and trees within algorithms.

Overview and Syllabus

Introduction to algorithms. Functions and the efficiency of the algorithms. Specification and performance of algorithms. Elementary data structures. Graphs and trees. Divide and conquer algorithms. Greedy algorithms.

Course Outline

	Topic
1	<u>Module 01: Analysis and Design of Algorithms</u> Introduction Objectives Lesson 01 : Introduction to Algorithm Lesson 02 : Efficiency of Algorithms Lesson 03 : Performance of Algorithms Summary Assessment
2	<u>Module 02: Elementary Data Structures: Linked Lists</u>

	<p>Introduction</p> <p>Objectives</p> <p>Lesson 01 : Singly Linked Lists</p> <p>Lesson 02 : Doubly Linked Lists</p> <p>Lesson 03 : Circular Linked Lists</p> <p>Summary</p> <p>Assessment</p>
3	<p><u>Module 03: Stacks, Queues and Recursion</u></p> <p>Introduction</p> <p>Objectives</p> <p>Lesson 01 : Stacks</p> <p>Lesson 02 : Queues and Priority Queues</p> <p>Lesson 03 : Recursion Algorithms</p> <p>Summary</p> <p>Assessment</p>
4	<p><u>Elementary data structures</u></p> <p>Introduction</p> <p>Objectives</p> <p>Lesson 01 : Trees, Binary Trees, and Binary Search Trees</p> <p>Lesson 02 : Searching a Binary Search Tree AND Tree Traversal</p> <p>Lesson 03 : Insertion and Deletion from Binary Search Trees</p> <p>Lesson 04 : Balancing Binary Search Trees</p> <p>Summary</p> <p>Assessment</p>
5	<p><u>Module 05: Graphs and Greedy Algorithms</u></p> <p>Introduction</p> <p>Objectives</p> <p>Lesson 01 : Graphs Definition And Graph Representation</p> <p>Lesson 02 : Graph Traversals</p> <p>Lesson 03 : Shortest Path</p> <p>Lesson 04 : Greedy Algorithms</p> <p>Summary</p> <p>Assessment</p>
6	<p><u>Module 06: Elementary Sorting Algorithms</u></p> <p>Introduction</p> <p>Objectives</p> <p>Lesson 01 : Insertion Sort</p> <p>Lesson 02 : Selection Sort</p> <p>Lesson 03 : Elementary Sorting Algorithm</p> <p>Summary</p>

	Assessment
7	<u>Module 07: Efficient Sorting Algorithms and Divide-and Conquer Algorithms</u> Introduction Objectives Lesson 01 : Efficient Sorting Algorithms Lesson 02 : Merge Sort Algorithm Lesson 03 : Radix Sort Lesson 04 : Divide-and Conquer Algorithms Summary Assessment