Course code	Course Title	L	T	P	C
BITE201L	Data Structures and Algorithms	3	0	0	3
Pre-requisite	NIL	Syllabus version			
		1.0			

Course Objectives:

1. To impart the basic concepts of data structures and algorithms
2. To derive the time and space complexity of algorithms.
3. To develop understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures.

Course Outcomes:

1. Identify user defined data types, linear data structures for solving real world problems.
2. Analyse and derive time and space complexity for algorithms designed.
3. Illustrate various techniques for searching, sorting and hashing
4. Write modular programs on nonlinear data structures and algorithms for solving engineering problems efficiently.
5. Design new algorithms or modify existing algorithms for new applications and reason about the efficiency of the result.

Module:1	Linear Data Structures	7 hours

Operations on Stack - Array implementation of Stack - Applications of Stack -Role of Stack in Recursion - Towers of Hanoi problem - Operations on Queue - Array implementation of Queue - Applications of Queue - Types of Queues

Module:2	Linked List	7 hours

Singly Linked List - Doubly Linked List - Circular Singly Linked List - Linked representation of Stack and Queue - Applications of Linked List

Module:3	Algorithm Analysis	6 hours

The Problem-Solving Aspect - Analysis Framework - Asymptotic Notations - Growth rate of Functions - Complexity Analysis - Mathematical Analysis of Recursive and Non-Recursive Algorithms

Module:4	Sorting and Searching	6 hours

Sorting - Bubble Sort, Insertion Sort, Selection Sort, Radix Sort, Merge Sort, Heap Sort, Shell Sort, Searching - Linear Search, Binary Search - Time Complexity Analysis of Sorting and Searching Algorithms - Hash Table Methods

Module:5	Non-Linear Data Structures	7 hours

Basic Terminology of General Trees and Binary Trees - Expression Trees - Tree Traversing – In-order, Pre-order and Post-order Traversals - Construction of Binary Search Tree - Operations on Binary Search Tree - Height Balanced Trees (AVL) - B-Trees

Module:6	Graphs	7 hours

Basic Definitions - Representations of Directed and Undirected Graphs - Traversals and Applications of Directed and Undirected Graphs - Single Source Shortest Path Algorithm – Dijkstra's Algorithm - Minimum Spanning Trees – Prim's and Kruskal's Algorithm.

Module:7	Strategies for Algorithm Design	3 hours

Dynamic Programming - Travelling Salesman Problem, Divide and Conquer - Quick Sort, Greedy Algorithms - Huffman Coding

Module 8	Contemporary Issues	2 hours

	Total Lecture hours:	**45 hours**

Text Books

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, 2019, 4th Edition, Pearson Education, Delhi.
2. J.P. Tremblay and P.G. Sorenson, “An Introduction to Data Structures with Applications”, 2017, 2nd Edition, Tata McGraw Hill, New Delhi.

Reference Books

1. Cormen, T.H., Leiserson, C.D., Rivest, R.L. & Stein, C. "Introduction to Algorithms" 2009, 3rd Edition. MIT Press, USA.
2. Seymour Lipschutz “Data Structures with C (Schaum's Outline series)” 2017, 1st Edition, McGraw Hill Education, India.

Mode of Evaluation: Continuous Assessment Tests, Assignment, Quiz, Final Assessment Test

Recommended by Board of Studies	20-05-2022		
Approved by Academic Council	No. 66	Date	16-06-2022