

<b>ITA5002</b>	<b>Problem Solving with Data Structures and Algorithms</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>J</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>3</b>
<b>Pre-requisite</b>	<b>Nil</b>	<b>Syllabus version</b>				
		<b>1.0</b>				
<b>Course Objectives:</b>						
<ol style="list-style-type: none"> <li>1. Familiarize with basic techniques of algorithm analysis and master the implementation of linked data structures.</li> <li>2. Familiarize with several sub-quadratic sorting algorithms.</li> <li>3. Familiarize with graph algorithms</li> </ol>						
<b>Expected Course Outcomes:</b>						
<ol style="list-style-type: none"> <li>1. Calculate to find the time and space complexities of various algorithms.</li> <li>2. Choose appropriate data structure as applied to specified problem definition.</li> <li>3. Handle operations like searching, insertion, deletion and traversing mechanism on various data structures.</li> <li>4. Use linear and non-linear data structures.</li> <li>5. Solve problems using data structures.</li> <li>6. Apply concepts learned in various domains</li> </ol>						
<b>Student Learning Outcomes (SLO):</b>						
<b>1,2,20</b>						
[ 1]. Having an ability to apply mathematics and science in engineering applications						
[ 2]. Having a clear understanding of the subject related concepts and of contemporary issues						
[20]. Having a good digital footprint						
<b>Module:1</b>	<b>Introduction to algorithm analysis</b>	<b>4 hours</b>				
<b>Fundamental Data Structures – Stacks and Queues</b>						
Stack ADT, Implementation of Stacks and applications. Queue ADT, Implementation of Queue and applications						
<b>Module:2</b>	<b>Fundamental Data Structures – List</b>	<b>7 hours</b>				
List ADT, Singly linked lists, Doubly Linked lists and Circular Linked Lists – Stack using linked list- queue using linked list						
<b>Module:3</b>	<b>Trees</b>	<b>7 hours</b>				
Tree ADT, Binary tree, Representation of binary tree, Binary tree traversals, Reconstruction of binary tree, Search Tree ADT,						
<b>Module:4</b>	<b>Sorting and Searching</b>	<b>6 hours</b>				
Insertion Sort, Selection, heap sort and Merge sort. Linear time sorting – bucket and radix sort. Linear search and binary search.						
<b>Module:5</b>	<b>Graph algorithms</b>	<b>7 hours</b>				
The Graph ADT, Representation of adjacency list and matrix, Graph traversals – Depth First Search and Breadth First Search implementation.						

<b>Module:6</b>	<b>Applications of graph</b>	<b>7 hours</b>	
Single pair shortest path: Dikstra’s algorithm, Spanning tree algorithm: prim’s algorithm, kruskal’s algorithm, all pair shortest path			
<b>Module:7</b>	<b>Analysis of sorting algorithms</b>	<b>5 hours</b>	
Divide and Conquer: merge sort, quick sort, insertion sort, bubble sort, selection sort, binary search			
<b>Module:8</b>	<b>Algorithm Design Techniques</b>	<b>2 hours</b>	
P,NP,NP complete, polynomial function, Dynamic programming, Divide and Conquer – Running time of divide and conquer technique, Backtracking technique			
	<b>Total Lecture hours:</b>	<b>45 hours</b>	
<b>Text Book(s)</b>			
1.	Mark Allen Weiss, Data Structure and Algorithm Analysis in C++, 2014, 4 <sup>th</sup> Edition, Pearson Education Limited.		
<b>Reference Books</b>			
1.	Anany Levitin, Introduction to design and analysis of algorithm, 2012, 3 <sup>rd</sup> Edition, Addison – Wesley.		
2	Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms, Paper Back, 2010, 3 <sup>rd</sup> Edition, MIT Press.		