

<b>Course code: Course Title</b>	<b>Course Structure</b>			<b>Pre-Requisite</b>
<b>SE315: Advanced Data Structures</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>NIL</b>
	<b>3</b>	<b>1</b>	<b>0</b>	

**Course Objective:** To study concepts of some advanced data structures like advanced trees and heaps.

<b>S. NO</b>	<b>Course Outcomes (CO)</b>
<b>CO1</b>	Understand advanced tree structures and their applications.
<b>CO2</b>	Apply mergeable heaps (Binomial, Fibonacci, 2-3-4 Heaps) for efficient data management.
<b>CO3</b>	Understand graph theory concepts.
<b>CO4</b>	Implement graph theory algorithms for efficient utilization of resources.
<b>CO5</b>	Create efficient techniques for searching and indexing to solve real world problems.

<b>S. NO</b>	<b>Contents</b>	<b>Contact Hours</b>
<b>UNIT 1</b>	<b>Advanced Trees:</b> Definitions Operations on Weight Balanced Trees (Huffman Trees), Height balanced trees- B trees, B+ trees, 2-3 Trees and Red-Black Trees. Augmenting Red-Black Trees to Dynamic Order Statics and Interval Tree and Applications. Operations on Disjoint sets and its union find problem Implementing Sets. Dictionaries, Priority Queues and Concatenable Queues using 2-3 Trees.	<b>8</b>
<b>UNIT 2</b>	<b>Mergeable Heaps:</b> Mergeable Heap Operations, Binomial Trees Implementing Binomial Heaps and its Operations, 2-3-4. Trees and 2-3-4 Heaps. Structure and Potential Function of Fibonacci Heap Implementing Fibonacci Heap.	<b>9</b>
<b>UNIT 3</b>	<b>Graph Theory Definitions:</b> Definitions of Isomorphism Components. Circuits, Fundamental Circuits, Cut-sets. Cut-Vertices Planer and Dual graphs, Spanning Trees, Kuratovski's two Graphs.	<b>8</b>
<b>UNIT 4</b>	<b>Graph Theory Algorithms:</b> Algorithms for Connectedness, Finding all Spanning Trees in a Weighted Graph and Planarity Testing, all pair shortest path algorithms. Min-Cut Max-Flow theorem of Network Flows. Ford-Fulkerson Max Flow Algorithms.	<b>9</b>
<b>UNIT 5</b>	Tries/digital search trees, Multiway tries, Suffix trees and applications, Quadtrees and Octrees and R-trees.	<b>8</b>
	<b>TOTAL</b>	<b>42</b>

## REFERENCES

<b>S.No.</b>	<b>Name of Books/Authors/Publishers</b>	<b>Year of Publication / Reprint</b>
<b>1</b>	Narsingh Deo, "Graph Theory with Application to Engineering and Computer Science", Reprint Edition, Dover Pubns.	<b>2016</b>
<b>2</b>	Sara Baase, Allen Van Gelder, "Computer Algorithms: Introduction to Design & Analysis", 3 <sup>rd</sup> Edition, Pearson Education India.	<b>2002</b>
<b>3</b>	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 4 <sup>th</sup> Edition, Mit Pr.	<b>2022</b>
<b>4</b>	Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "The Design and	<b>2002</b>

	Analysis of Computer Algorithms”, 1 <sup>st</sup> Edition, Pearson India.	
<b>5</b>	Ellis Horowitz, Sartaj Sahni, “Fundamentals of Data Structures”, 5 <sup>th</sup> Edition, Computer Science Press.	<b>1976</b>