

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

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

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

S. NO	Contents	Contact Hours
UNIT 1	Advanced Trees: 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.	8
UNIT 2	Mergeable Heaps: 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.	9
UNIT 3	Graph Theory Definitions: Definitions of Isomorphism Components. Circuits, Fundamental Circuits, Cut-sets. Cut-Vertices Planer and Dual graphs, Spanning Trees, Kuratovski's two Graphs.	8
UNIT 4	Graph Theory Algorithms: 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.	9
UNIT 5	Tries/digital search trees, Multiway tries, Suffix trees and applications, Quadrees and Octrees and R-trees.	8
TOTAL		42

REFERENCES

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

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