ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS
Syllabus

Course Code:	23CS3301/ 23AM3301/ 23DS3301	Year:	II	Semester:	I
Course Category:	Professional Core Course	Branch:	CSE/AI& ML/DS	Course Type:	Theory
Credits:	3	L-T-P:	3-0-0	Prerequisites:	Data Structures through C / Object Oriented Programming
Continuous Internal Evaluation:	30	Semester End Evaluation:	70	Total Marks:	100

COURSE OUTCOMES		
Upon successful completion of the course, Student will be able to		
CO1	Understand the fundamental concepts of algorithm analysis and design techniques.	L2
CO2	Apply various algorithm design techniques for solving problems	L3
CO3	Apply the concepts of Trees and Graphs for solving problems effectively.	L3
CO4	Analyze the given scenario and choose appropriate algorithm design for solving problems.	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)													
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	2								1	1		1	1	1
CO3	2								1	1		1	1	1
CO4		2							1	1		1		1

Unit No.	SYLLABUS CONTENTS	Mapped CO
I	**Introduction**: Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations. **AVL Trees** – Creation, Insertion, Deletion operations **B-Trees** – Creation, Insertion, Deletion operations., Applications,	**CO1, CO3**
II	**Heap Trees** (Priority Queues) – Min and Max Heaps, Operations and Applications **Graphs** – Terminology, Representations, Basic Search and Traversals, Sets and Disjoint set Union, Applications	**CO1, CO3**
III	**Divide and Conquer:** The General Method, Max-Min, Quick Sort, Merge Sort, Strassen's matrix multiplication **Greedy Method:** General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths	**CO1, CO2, CO3, CO4**
IV	**Dynamic Programming:** General Method, All pairs shortest paths, Single Source Shortest Paths– General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem.	**CO1, CO2, CO3, CO4**
V	**Backtracking:** General Method, n-Queens Problem, Sum of Subsets problem, Graph Coloring, **Branch and Bound:** The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem. **Introduction to Complexity classes:** P and NP Problems, NP-Complete Problems.	**CO1, CO2, CO3, CO4**

Learning Resources
Text Books
1.Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2ndEdition Universities Press
2.Computer Algorithms in C++, Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, 2nd Edition University Press
3. Fundamentals of Computer Algorithms, Ellis Horowitz, SartajSahni , Sanguthevar Rajasekaran, 2nd Edition, Universities Press,
References Text Book
1. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
2. An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill
3. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.
4. Data Structures using C & C++: Langsam, Augenstein&Tanenbaum, Pearson, 1995
5. Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub.
6. Data structures in Java:, Thomas Standish, Pearson Education Asia
e-Resources and other Digital Material
1. https://www.tutorialspoint.com/advanced_data_structures/index.asp
2. http://peterindia.net/Algorithms.html

3. Abdul Bari,Introduction to Algorithms (youtube.com)