SWARNANDHRA
COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
Accredited by National Board of Accreditation, AICTE, New Delhi, Accredited by NAAC with "A" Grade – 3.32 CGPA, Recognized under 2(f) & 12(B) of UGC Act 1956, Approved by AICTE, New Delhi, Permanent Affiliation to JNTUK, Kakinada
Seetharampuram, W.G.DT., Narsapur-534280, (Andhra Pradesh)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

TEACHING PLAN

Course Code	Course Title	Semester/ Regulation	Branch	Contact Periods /Week	Academic Year	Date of commencement of Semester
23CS3T02	Advanced Data Structures and Algorithms	III / R23	AI & ML	5	2024-25	30-07-2024

Pre-requisites:	Data Structures

COURSE OUTCOMES		Knowledge Levels
CO1	Discover the performance of an algorithm using asymptotic notation.	K2
CO2	Understand basic graph concepts and analyze their connected components.	K3
CO3	Use divide and conquer strategies, greedy methods to solve optimization problems.	K3
CO4	Understand Dynamic Programming, Backtracking to solve complex problems like shortest paths and Travelling Salesperson problems.	K2
CO5	Learn Branch and Bound techniques and understand NP Hard, NP Complete problems.	K2

Unit	Out Comes / Bloom's Level	Topics No.	Topics/Activity	Text Book / Reference	Contact Hour	Delivery Method
			UNIT- I			
I	CO1: Discover the performance of an algorithm using asymptotic notation. (K2)	1.1	Introduction to Algorithm Analysis	T1,R1	1	Chalk & Talk, PPT
		1.2	Space and Time Complexity analysis	T1,R1	1	
		1.3	Asymptotic Notations	T1,R1	2	
		1.4	Introduction to AVL Tree	T1,R1	1	
		1.4.1	AVL Tree Creation, Insertion operations	T1,R1	2	
		1.4.2	Deletion operation in AVL Tree	T1,R1	2	
		1.4.3	AVL Tree Applications	T1,R1	1	
		1.5	Introduction to B-Tree	T1,R1	1	
		1.5.1	B-tree Creation, Insertion	T1,R1	2	

			operations			
		1.5.2	Deletion operation in B Tree	T1,R1	1	
		1.5.3	B Tree Applications	T1,R1	1	
		Revision of Unit - I			1	
				Total	**16**	
UNIT- II: Heap Trees, Graphs						
II	CO2: Understand basic graph concepts and analyze their connected components.(K3)	2.1	Introduction to Heap Trees (Priority Queues)	T1,R2,R3	2	**Chalk & Talk, PPT**
		2.1.1	Min Heap Tree operations	T1,R2,R3	2	
		2.1.2	Min Heap Tree operations	T1,R2,R3	2	
		2.1.3	Heap Tree Applications	T1,R2,R3	2	
		2.2	Introduction to Graphs	T1,R2,R3	1	
		2.2.1	Terminology	T1,R2,R3		
		2.2.2	Graph Representations	T1,R2,R3	1	
		2.2.3	Basic Search and Traversals	T1,R2,R3	2	
		2.2.4	Connected Components	T1,R2,R3	1	
		2.2.5	Biconnected Components	T1,R2,R3	1	
		2.2.6	Applications of Graphs	T1,R2,R3	2	
		Revision of Unit - II			1	
				Total	**17**	
UNIT- III: Divide and Conquer, Greedy Method						
		3.1	Introduction to Divide and Conquer	T2	1	
III	CO3: Use divide and conquer strategies, greedy methods to solve optimization problems.(K3)	3.1.1	The General Method	T2,R3,R4,R5	1	
		3.1.2	Quick Sort	T2,R3,R4,R5	1	
		3.1.3	Merge Sort	T2,R3,R4,R5	1	
		3.1.4	Strassen's matrix multiplication	T2,R3,R4,R5	2	
		3.2	Introduction to Greedy method	T2	1	**Chalk & Talk, PPT**
		3.2.1	General Method	T2,R3,R4,R5	1	
		3.2.2	Job Sequencing with deadlines	T2,R3,R4,R5	1	
		3.2.3	Knapsack Problem	T2,R3,R4,R5	1	

		3.2.4	Minimum cost spanning trees	T2,R3,R4,R5	2	
		3.2.5	Single Source Shortest Paths	T2,R3,R4,R5	1	
			Revision of Unit - III		1	
				Total	**14**	
UNIT- IV: Dynamic Programming, Backtracking						
IV	CO4: Understand Dynamic Programming, Backtracking to solve complex problems like shortest paths and Travelling Salesperson problems.(K2)	4.1	Introduction to Dynamic Programming	T2	1	**Chalk & Talk, PPT**
		4.1.1	General Method	T2,R6	1	
		4.1.2	All pairs shortest paths	T2,R6	1	
		4.1.3	Single Source Shortest Paths– General Weights (Bellman Ford Algorithm)	T2,R6	2	
		4.1.4	Optimal Binary Search Trees	T2,R6	1	
		4.1.5	0/1 Knapsack	T2,R6	1	
		4.1.6	String Editing	T2,R6	1	
		4.1.7	Travelling Salesperson problem	T2,R6	1	
		4.2	Introduction to Backtracking	T2	1	
		4.2.1	General Method	T2,R6	1	
		4.2.2	8-Queens Problem	T2,R6	1	
		4.2.3	Sum of Subsets problem	T2,R6	1	
		4.2.4	Graph Coloring	T2,R6	1	
		4.2.5	0/1 Knapsack Problem	T2,R6	1	
			Revision of Unit - IV		1	
				Total	**16**	
UNIT- V: Branch and Bound, NP Hard and NP Complete Problems						
V	CO5: Learn Brach and Bound techniques and understand NP Hard, NP Complete problems.(K2)	5.1	Introduction to Branch and Bound	T2	1	**Chalk & Talk, PPT**
		5.1.1	The General Method	T2, R7	1	
		5.1.2	0/1 Knapsack Problem	T2, R7	1	
		5.1.3	Travelling Salesperson problem.	T2, R7	1	
		5.2	Introduction NP Hard and NP Complete Problems	T2,R7	1	
		5.2.1	Basic Concepts	T2, R7	1	
		5.2.2	Cook's theorem	T2, R7	1	

		5.2.3	NP Hard Graph Problems: Clique Decision Problem (CDP)	T2, R7	1
		5.2.4	Chromatic Number Decision Problem (CNDP)	T2, R7	1
		5.2.5	Traveling Salesperson Decision Problem (TSP)	T2, R7	1
		Revision of Unit - V			1
				Total	**11**
				CUMULATIVE PROPOSED PERIODS	**74**

Text Books:

S.No	AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OFPUBLICATION
1	Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh , Fundamentals of Data Structures in C++, 2nd Edition Universities Press, 2006.
2	Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Computer Algorithms/C++ 2nd Edition University Press, 2019.

Reference Books:

S.No	AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OFPUBLICATION
1	Robert Kruse, Data Structures and program design in C, 2nd Edition, Pearson Education Asia 2006.
2	Trembley & Sorenson, An introduction to Data Structures with applications, McGrawHill, 2017.
3	Donald E Knuth, The Art of Computer Programming, Vol1:Fundamental Algorithms, Addison-Wesley, 1997.
4	Langsam, Augenstein & Tanenbaum, Data Structures using C & C++, Pearson, 1995.
5	N.Wirth, Algorithms + Data Structures & Programs, 1st edition, PHI, 2009.
6	Horowitz Sahni & Mehta, Fundamentals of Data Structures in C++: Galgottia Pub, 2008.
7	Thomas Standish, Data structures in Java:, 4th edition, Pearson Education Asia, 2021.

Web References

1	https://www.tutorialspoint.com/advanced_data_structures/index.asp
2	http://peterindia.net/Algorithms.html
3	Introduction to Algorithms (youtube.com)
4	https://www.swarnandhra.ac.in/dsv
5	bit.ly/BRK_DSV

		Name	Signature with Date
i.	Faculty	Mrs. V. Sri Lakshmi	V. Sri Lo
ii.	Course Coordinator	Dr. G. Sudhakar	
iii.	Module Coordinator	Dr. B. Rama Krishna	BRK
iv.	Programme Coordinator	Dr. B. Rama Krishna	BRK

Principal