Guru Tegh Bahadur Institute of Technology, New Delhi

Lesson Plan for (Algorithm Design & Analysis)

Course Name: B.Tech. **Semester: 5th** **SUB CODE: ETCS 301**

No of hours allotted to complete the syllabi: **40**
No of hours allotted per week: **4**

S.No	Topic Details	No of Hours Planned	Reference/text book
1.	**Unit-I:** Asymptotic notations for time and space complexity, Big-Oh notation, Θ notation, Ω notation, the little-oh notation, the little-omega notation.	1	T1,R1
	Recurrence relations: iteration method, recursion tree method, substitution method, master method (with proof), subtract and conquer master method(with proof)	4	T1, R2
	Data Structures for Disjoint Sets, Medians and Order statistics.	2	T1
	Complexity analysis, Insertion sort, Merge Sort, Quick sort.	2	T1, R2
	Strassen's algorithm for Matrix Multiplications.	1	T1, R1
2.	**Unit-II** **Dynamic Programming:** Ingredients of Dynamic	2	T1, T2, R3

	Programming, emphasis on optimal substructure, overlapping substructures, memorization. Matrix Chain Multiplication Longest common subsequence Optimal binary search trees problems.0-1 knapsack problem. Binomial coefficient computation through dynamic programming. Floyd Warshall algorithm.	7	T1, T2, R1
3.	**Unit-III** **Greedy Algorithms**: Elements of Greedy strategy, overview of local and global optima, matroid Activity selection problem, Fractional Knapsack problem, Huffman Codes, A task scheduling problem. Minimum Spanning Trees: Kruskal's and Prim's Algorithm, Single source shortest path: Dijkstra's and Bellman Ford Algorithm(with proof of correctness of algorithms).	1 4 5	T1, T2 T1, T2, R4 T1, R4

4.	**UNIT – IV** **String matching:** The naïve String Matching algorithm, The Rabin-Karp Algorithm, String Matching with finite automata, The Knuth-Morris Pratt algorithm.	5	T1, R1
	NP-Complete Problem: Polynomial-time verification, NP-Completeness and Reducibility	2	T1, R1
	NP-Completeness Proof NP –hard, Case study of NP-Complete problems (vertex cover problem, clique problem).	3	T1, R1

Text Books:

[T1] T. H. Cormen, C. E. Leiserson, R. L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Ed., PHI, 2013.

[T2] Jon Klenberg,Eva Tardos,"Algorithm Design", Pearson Publications,2014

Reference Books:

[R1] Sara Basse, "introduction to Design & analysis",Pearson

[R2] Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Computer Algorithms/C++ "Second Edition, Universities Press.

[R3] A. V. Aho, J. E. Hopcroft, J. D. Ullman, "The Design and Analysis of Computer Algorithms", Pearson Publication, 2013.

[R4] Richard Neapolitan, "Foundations of Algorithms" , Fifth Edition, Jones & Bartlett Learning