DAYANANDA SAGAR COLLEGE OF ENGINEERING

An Autonomous Institute Affiliated to VTU, Belagavi Approved by AICTE ; ISO 9001:2015 Certified
Accredited by National Assessment Accreditation Council (NAAC) with 'A' grade
Shavige Malleshwara Hills, Kumaraswamy Layout, Bengaluru-560078

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Design and Analysis of Algorithms

Course code: 21CS43 **Credits: 04**
L: T: P: S: 3:0:2:0 **CIE Marks: 50**
Exam Hours: 03 **SEE Marks: 50**
Total Hours: 50

Course Outcomes:
At the end of the course, student will be able to:

CO1	Understand different algorithm efficiency parameters.
CO2	Analyze efficiency of Recursive and Non-recursive algorithms using asymptotic notations.
CO3	Learn algorithm design techniques.
CO4	Analyze the complexity of the algorithms using formal approaches.
CO5	Solve problems choosing appropriate algorithm and compute its space and time complexity.
CO6	Analyze and categorize problems as P, NP, and NP- Complete.

Unit	Contents of the unit	Hours	CO's
1	**Introduction**: What is an algorithm? Fundamentals of Algorithmic Problem Solving. Analysis of Algorithm Efficiency: The Analysis Framework, Asymptotic and Basic Efficiency Classes, Mathematical Analysis of Non recursive, Algorithms Mathematical Analysis of Recursive Algorithms **Brute Force Method**: Introduction, Bubble sort, Selection sort, Linear search, Brute-Force String Matching	**8**	CO-1 CO-2
2	**Divide-And-Conquer**: Introduction, Master theorem, Binary search, Quick sort, Merge sort, Multiplication of Large Integers and Stassen's Matrix Multiplication. **Decrease-and-conquer**: Representation of Graphs, Insertion Sort, Depth-First Search and Breadth-First Search, Topological Sorting, Algorithms for Generating Combinatorial Objects	**8**	CO-3 CO-4

3	**Space and Time Trade-Offs**: Introduction, sorting by Counting, Input Enhancement in String Matching, Hashing. **Dynamic Programming**: Introduction, Warshall's and Floyd's Algorithms, Matrix-chain multiplication, Longest common subsequence, knapsack 0/1	**8**	CO-3 CO-4 CO-5
4	**Greedy Technique**: Introduction, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Bellman – Ford Algorithm, Huffman codes. **Limitations of Algorithm Power**: Lower-Bound Arguments, Decision Trees, P, NP, and NP-Complete Problems, NP-Complete Problems	**8**	CO-3 CO-4 CO-5
5	**Coping with the Limitations of Algorithm Power**: Backtracking: n-Queens Problem Hamiltonian Circuit Problem Subset-Sum Problem **Branch-and-Bound**: Assignment Problem, Knapsack Problem, Traveling Salesman Problem **Pram Algorithms**: Introduction, Computational Model, Parallel Algorithms for Prefix Computation	**8**	CO-3 CO-5 CO-6

Text Books:

1. Introduction to the Design and Analysis of Algorithms, AnanyLevitin, Third Edition, Pearson, 2011.
2. Introduction to Algorithms, Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, Third Edition, the MIT Press, 2009.

Reference Books:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahni and Rajasekharam,2nd Edition, University Press Pvt. Ltd, 2009.
2. Analysis and design of Algorithms, Padma Reddy, Sri Nandi Publications, 2009.