JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
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DESIGN AND ANALYSIS OF ALGORITHMS					

Course Objectives:
- To provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms
- To introduce the different algorithmic approaches for problem solving through numerous example problems
- To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness

Course Outcomes:
- Describe asymptotic notation used for denoting performance of algorithms
- Analyze the performance of a given algorithm and denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
- List and describe various algorithmic approaches
- Solve problems using divide and conquer, greedy, dynamic programming, backtracking and branch and bound algorithmic approaches
- Apply graph search algorithms to real world problems
- Demonstrate an understanding of NP- Completeness theory and lower bound theory

UNIT I
Introduction: Algorithm Definition, Algorithm Specification, performance Analysis, Performance measurement, Asymptotic notation, Randomized Algorithms.
Sets & Disjoint set union: introduction, union and find operations.
Basic Traversal & Search Techniques: Techniques for Graphs, connected components and Spanning Trees, Bi-connected components and DFS.

UNIT II
Divide and Conquer: General Method, Defective chessboard, Binary Search, finding the maximum and minimum, Merge sort, Quick sort.
The Greedy Method: The general Method, container loading, knapsack problem, Job sequencing with deadlines, minimum-cost spanning Trees.

UNIT III
Dynamic Programming: The general method, multistage graphs, All pairs-shortest paths, single-source shortest paths: general weights, optimal Binary search trees, 0/1 knapsack, reliability Design, The traveling salesperson problem, matrix chain multiplication.

UNIT IV
Backtracking: The General Method, The 8-Queens problem, sum of subsets, Graph coloring, Hamiltonian cycles, knapsack problem.
Branch and Bound: FIFO Branch-and-Bound, LC Branch-and-Bound, 0/1 Knapsack problem, Traveling salesperson problem.

UNIT V
NP-Hard and NP-Complete problems: Basic concepts, Cook's Theorem.
String Matching: Introduction, String Matching-Meaning and Application, NaÏve String Matching Algorithm, Rabin-Karp Algorithm, Knuth-Morris-Pratt Automata, Tries, Suffix Tree.

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Text Books:
1) Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, " Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.
2) Harsh Bhasin, " Algorithms Design & Analysis", Oxford University Press.

Reference Books:
1) Horowitz E. Sahani S: "Fundamentals of Computer Algorithms", 2nd Edition, Galgotia Piblications, 2008.
2) S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press.

e-Resources:
1) http://nptel.ac.in/courses/106101060/