U23CS453	Design and Analysis of Algorithms Laboratory	L	T	P	J	C
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1.Course Description:

In this practical course students will immerse themselves in the application of foundational algorithmic techniques to real-world problems. Through hands-on exercises, coding assignments and project work, students will gain practical experience in Algorithm Analysis Techniques, including Brute Force, Divide-and-Conquer, Dynamic Programming, Greedy Approach, Backtracking and Branch and Bound. By implementing these algorithms in various programming languages, students will develop a deep understanding of their operation, efficiency and applicability across different problem domains. Through iterative refinement and experimentation, students will hone their algorithmic design skills, learning to optimize solutions for performance and scalability.

2.Course Objectives:

1. To understand the techniques for analyzing algorithms
2. To learn the paradigms for designing the algorithms
3. To analyze the efficiency of various algorithm design techniques
4. To understand the limitations of algorithmic power

3.List of Laboratory Experiments / Exercises:

1. Implementation of string algorithms
2. Demonstration of applications of string algorithms (Naïve algorithm, Rabin Karp Algorithm, KMP Algorithm and Manachers algorithm)
3. Implementation of brute force and divide-and-conquer techniques
4. Demonstration of applications of brute force and divide and conquer techniques (Boyer Moore algorithm, Travelling salesman problem, Knapsack problem, Assignment problem, Jump game, Maximum subarray, Merge Intervals, Tiling problem, Karatsuba algorithm)
5. Implementation of dynamic programming
6. Demonstration of applications of dynamic programming (Warshall's algorithm, Floyd's algorithm, Knapsack Problem, Longest Common Subsequence, Levenshtein distance (Edit distance) problem, Longest palindrome, Longest common substring, Longest happy string, Palindrome partitioning, Minimum coin change, Equal subset sum partition, Wildcard matching, longest repeated subsequence)
7. Implementation of Greedy approach
8. Demonstration of applications of Greedy approach (Activity Selection Problem, Graph Colouring Problem, Huffman coding compression algorithm, shortest superstring problem, Flip the world, Dials algorithm, Minimum spanning tree, Sieve of sundaram, Remove invalid parenthesis, Maximum ribbon cut)
9. Implementation of backtracking and branch & bound

10. Demonstration of applications of backtracking and branch & bound (Queen problem, Hamiltonian circuit problem, Knight's tour problem, Subset sum problem, Sudoku Solver, Letter combinations of a phone number, Combinatorial optimization problems, Zigzag conversion, Valid Sudoku, People holding hands, Reverse pairs)

Mini project: Create a simple gaming application

References:

1. Anany Levitin, ―Introduction to the Design and Analysis of Algorithms‖, Third Edition, Pearson Education, 2012James
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, ―Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012

4. Course Outcomes:

CO. No.	Course Outcome	BTL	POs	PSOs
U23CS453.1	Demonstrate the ability to identify, define, and analyze complex problems using appropriate algorithms, data structures, methodologies and tools	K6	1, 2, 3, 4, 5, 7, 9, 11, 12	2, 3
U23CS453.2	Design effective visual representations (UML diagrams/Flowchart) to solve the identified problems	K3	1, 2, 3, 4, 5, 7, 9, 11, 12	2, 3
U23CS453.3	Develop and analyze algorithms and implement them using suitable programming platforms	K3	1, 2, 3, 4, 5, 7, 9, 11, 12	2, 3
U23CS453.4	Develop effective presentation skills to present and defend the designs and solutions	K3	1, 2, 3, 4, 5, 7, 9, 11, 12	2, 3
U23CS453.5	Understand issues related to privacy, security and accessibility and adhere to coding standards	K2	1, 2, 3, 4, 5, 7, 9, 11, 12	2, 3

5. Course Articulation matrix:

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
U23CS453.1	3	3	3	3	2	-	1	-	1	-	2	2	-	1	2
U23CS453.2	3	3	3	3	2	-	1	-	1	-	2	2	-	1	2
U23CS453.3	3	3	3	3	2	-	1	-	1	-	2	2	-	1	2
U23CS453.4	3	3	3	3	2	-	1	-	1	-	2	2	-	1	2
U23CS453.5	3	3	3	3	2	-	1	-	1	-	2	2	-	1	2
Course to PO	3	3	3	3	2	-	1	-	1	-	2	2	-	1	2