INTRODUCTION TO ALGORITHMS AND ANALYSIS

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INTENDED AUDIENCE : UG,PG, B. Tech., M. Tech., M. Sc.

INDUSTRIES APPLICABLE TO : IT Companies

COURSE OUTLINE :

This course provides an introduction to mathematical modeling of computational problems. It covers the common algorithms, algorithmic paradigms, and data structures used to solve these problems. The course emphasizes the relationship between algorithms and programming, and introduces basic performance measures and analysis techniques for these problems.

ABOUT INSTRUCTOR :

Prof. Sourav Mukhopadhyay is an associate professor, Department of Mathematics at Indian Institute of Technology Kharagpur. He has completed his B.Sc (Honours in Mathematics) in 1997 from University of Calcutta, India. He has done M.Stat (in statistics) and M.Tech (in computer science) from Indian Statistical Institute, India, in 1999 and 2001 respectively. He worked with Cryptology Research Group at Indian Statistical Institute as a PhD student and received his Ph.D. degree in Computer Science from there in 2007. He was a Research Assistant at the Computer Science department of School of Computing, National University of Singapore (NUS). He visited Inria Rocquencourt, project CODES, France and worked as a post-doctoral research fellows at the School of Computer Engineering, Nanyang Technological University (NTU), Singapore. He was a post-doctoral research fellows and a part time Lecturer with School of Electronic Engineering, Dublin City University (DCU), Ireland.

COURSE PLAN :

Week 1: Sorting problem, time complexity, asymptotic analysis.
Week 2: Solving recurrence, Divide-and-Conquer.
Week 3: Quicksort and Heap Sort, Decision Tree.
Week 4: Linear time Sorting, Order Statistics.
Week 5: Hash Function, Binary Search Tree (BST) Sort.
Week 6: Randomly build BST, Red Black Tree, Augmentation of data structure.
Week 7: Van Emde Boas, Amortized analysis, Computational Geometry.
Week 8: Dynamic Programming, Graphs, Prim's Algorithms.
Week 9: BFS & DFS, Shortest path problem, Dijktra, Bellman Ford.
Week 10: All pairs shortest path, Floyd-Warshall, Johnson Algorithm.
Week 11: More amortized analysis, disjoint set data structure.
Week 12: Network flow, computational complexity.