Course Name	Design and Analysis of Algorithms	Course Code	CS2002			
Offered by Department	Computer Science and Engineering	Structure (LTPC)	3	1	0	4
To be offered for	B.Tech	Course Type	Core			
Prerequisite	NIL	Approved In	Senate-44			
Learning Objectives	• To design time or space efficient algorithms using well known paradigms. • To understand the limitations of computing machines. • To explore tractable vs intractable problems.					
Learning Outcomes	• To design efficient algorithms using paradigms such as divide and conquer, dynamic programming, greedy method etc. • To differentiate easy vs hard problems. • To design polynomial-time algorithms with proof of correctness.					
Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)	• Review of time/space complexity – recurrence relations – recurrence tree method – master's theorem (5L,2T) • Incremental and decremental strategies – divide and conquer – case studies – lower bounds for sorting (5L,3T) • Greedy Method – Container loading – knapsack – scheduling – coin change – proof of correctness (8L,2T) • Dynamic programming – matrix chain, optimal binary search tree, travelling salesman, LCS, knapsack, greedy vs dynamic programming – Principle of optimality, overlapping sub problems – Dynamic programming vs Divide and Conquer (8L,2T) • Graph algorithms – Topological sort – Shortest path algorithms – Dijskstra's Algorithm, – Bellman-Ford's Algorithm – minimum spanning tree – Principle of optimality (8L,2T) • Tractability - Introduction to NP-completeness – NP, NP-hardness, polynomial-time reductions (6L,1T) • Coping with intractable problems - Branch and bound – Back tracking – case studies (5L,1T) • Solvable vs Unsolvable problems – Halting problem, Reducibility to Halting problem (3L)					
Essential Reading	1. T. H. Cormen, C. E. Leiserson, and R. L. Rivest, "Introduction to Algorithms," Prentice Hall India, 2 nd Edition, 2001. ISBN 978-0-262-53305-8 2. E. Horowitz, S. Sahni, and S. Rajasekaran, "Computer Algorithms," 2 nd Edition, Galgotia Publications, 2007. ISBN 0-7167-8316-9					
Supplementary Reading	1. Aho, Hopcroft, and Ullmann, "Data Structures & Algorithms," Addison Wesley, 1983. ISBN13: 9780201000238 2. Algorithm Design , Eva Tardos and Kleinberg, Pearson, 2006, ISBN-13 : 978-0321295354					

Course Name	Digital System Design Practice	Course Code	CS2003			
Offered by Department	Computer Science and Engineering	Structure	0	0	4	2
To be offered for	B.Tech	Course Type	Core			