

Course Code	Course Name	Credit
CSC402	Analysis of Algorithms	3

<b>Prerequisite:</b> Data structure concepts, Discrete structures	
<b>Course Objectives:</b>	
1	To provide mathematical approaches for Analysis of Algorithms
2	To understand and solve problems using various algorithmic approaches
3	To analyze algorithms using various methods
<b>Course Outcomes:</b> At the end of the course learner will be able to	
1	Analyze the running time and space complexity of algorithms.
2	Describe, apply and analyze the complexity of divide and conquer strategy.
3	Describe, apply and analyze the complexity of greedy strategy.
4	Describe, apply and analyze the complexity of dynamic programming strategy.
5	Explain and apply backtracking, branch and bound.
6	Explain and apply string matching techniques.

Module		Detailed Contents	Hours
1		<b>Introduction</b>	8
	1.1	Performance analysis, space, and time complexity Growth of function, Big-Oh, Omega Theta notation Mathematical background for algorithm analysis. Complexity class: Definition of P, NP, NP-Hard, NP-Complete Analysis of selection sort, insertion sort.	
	1.2	Recurrences: The substitution method, Recursion tree method, Master method	
2		<b>Divide and Conquer Approach</b>	6
	2.1	General method, Merge sort, Quick sort, Finding minimum and maximum algorithms and their Analysis, Analysis of Binary search.	
3		<b>Greedy Method Approach</b>	6
	3.1	General Method, Single source shortest path: Dijkstra Algorithm Fractional Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees: Kruskal and Prim's algorithms	
4		<b>Dynamic Programming Approach</b>	9
	4.1	General Method, Multistage graphs, Single source shortest path: Bellman Ford Algorithm All pair shortest path: Floyd Warshall Algorithm, Assembly-line scheduling Problem 0/1 knapsack Problem, Travelling Salesperson problem, Longest common subsequence	
5		<b>Backtracking and Branch and bound</b>	6
	5.1	General Method, Backtracking: N-queen problem, Sum of subsets, Graph coloring	
	5.2	Branch and Bound: Travelling Salesperson Problem, 15 Puzzle problem	
6		<b>String Matching Algorithms</b>	4
	6.1	The Naïve string-matching algorithm, The Rabin Karp algorithm, The Knuth-Morris-Pratt algorithm	

<b>Textbooks:</b>	
1	T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", 2 <sup>nd</sup> Edition, PHI Publication 2005.
2	Ellis Horowitz, Sartaj Sahni, S. Rajsekar. "Fundamentals of computer algorithms" University Press.

<b>References:</b>	
1	Sanjoy Dasgupta, Christos Papadimitriou, Umesh Vazirani, “Algorithms”, Tata McGraw-Hill Edition.
2	S. K. Basu, “Design Methods and Analysis of Algorithm”, PHI

<b>Assessment:</b>	
<b>Internal Assessment:</b>	
Assessment consists of two class tests of 20 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and second class test when additional 40% syllabus is completed. Duration of each test shall be one hour.	
<b>End Semester Theory Examination:</b>	
1	Question paper will comprise of total six questions.
2	All question carries equal marks
3	Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4	Only Four question need to be solved.
5	In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

<b>Useful Links</b>	
1	<a href="https://nptel.ac.in/courses/106/106/106106131/">https://nptel.ac.in/courses/106/106/106106131/</a>
2	<a href="https://swayam.gov.in/nd1_noc19_cs47/preview">https://swayam.gov.in/nd1_noc19_cs47/preview</a>
3	<a href="https://www.coursera.org/specializations/algorithms">https://www.coursera.org/specializations/algorithms</a>
4	<a href="https://www.mooc-list.com/tags/algorithms">https://www.mooc-list.com/tags/algorithms</a>