

Program	Bachelor of Technology (BTech)	Semester - 4
Type of Course	Professional Core	
Prerequisite	Data Structure	
Course Objective	This course introduces various methods to design and analyze algorithms. Students will learn d algorithms for given computational tasks and evaluate their relative merits based on the performeasures.	

Teaching Scheme (Contact Hours)				Examination Scheme				
Locture	Tutorial	Drestical	Theory Marks		Practica	al Marks	Total	
Lecture	Tutorial	Practical	Credit	SEE	CIA	SEE	CIA	Marks
3	0	2	4	70	30	25	25	150

SEE - Semester End Examination, CIA - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

Cou	rse Content	T - Teaching Hours W -	- Wei	ghtag
Sr.	Topics		Т	W
1	Introduction to	Algorithms and Mathematics and Analysis of Algorithm:	10	20
	Relations, Linea Analysis of Algo statement, Sort	porithm, Characteristics of Algorithm, Algorithm design techniques, Mathematics for algorithmic sets, Fur ir inequalities, and Linear equations prithm: Algorithm Analysis, Average, best and worst case analysis, Asymptotic Notations, Analysing contr ing Algorithms and Performance analysis: Bubble sort, Selection sort, Insertion sort, Shell sort, Heap sort and Counting sort	rol	
2	Divide and Cond	juer Algorithm	9	20
		nces, Substitution Method, Recurrence Tree Method, Master's Method, Linear, and binary searching, Mergiplying Large Integers, Matrix Multiplication.	ge soi	rt,
3	Greedy Algorith	m	9	20
		teristics of greedy algorithms, Make a change problem, Activity selection problem, Minimum Spanning Tro im's Algorithm, Single source shortest path dijkstra's Algorithm, Knapsack Problem, Huffman Code, Job S		
4	Dynamic Progra	ımming	9	20
4	The Principle of pair shorted pat	Imming Optimality, Generalized solution using Dynamic Programming, Make a change Problem, 0/1 Knapsack Pr Ch — Floyd's Algorithm, Chain Matrix Multiplication, Longest common subsequence, Assembly Line Sched Binomial Coefficient	robler	n, All

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Total 45

100



Sr.	Topics	T	W
	An introduction using graphs, Directed and Undirected graphs, Graph Traversal: DF Sorting. Branch and bound: Introduction, The Eight queens problem, Knapsack problem usin String Matching: Introduction, The naive string matching algorithm, The Rabin-Karl automata, The Knuth-Morris-Pratt algorithm. NP-Completeness: Computational Classes: – P, NP, NP-Complete, and NP-Hard	branch and bound Min-Max Principle.	I

Suggested Distri	bution Of Theory M	larks Using Bloom'				
Level	Remembrance	Understanding	Application	Analyze	Evaluate	Create
Weightage	15	25	25	25	10	0

NOTE: This specification table shall be treated as a general guideline for the students and the teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Cours	Outcomes		
At the	At the end of this course, students will be able to:		
CO1	liscuss the basics of algorithmic techniques.		
C02	pply the time complexity and their notations in problem-solving.		
CO3	nalyse the general strategies of algorithms.		
C04	mplementation of algorithmic problems.		
CO5	lescribe the classes P, NP, and NP Complete.		

Refe	rence Books	
1.	Fundamental of A By Gills Brassard	Algorithms d, Paul Bratley PHI
2.	2. Introduction to Algorithms By Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein PHI	
3.	Fundamentals of By E. Horowitz et	•

List of Practical

- 1. Implement various problems using iterative and recursive approach
 - 1. Write a recursive program for calculation of factorial of an integer.
 - 2. Write a program to print the first 50 natural numbers using recursion.
 - Write a program to calculate the sum of numbers from 1 to n using recursion.
- 2. Implement various array operations using recursion
 - 1. Write a program to print the array elements using recursion.
 - Write a program to count the digits of a given number using recursion.
 - 3. Write a program to calculate the power of any number using recursion.
- 3. Implement matrix transpose, addition and multiplication operations
 - 1. Write a program to print the transpose of a matrix.
 - 2. Write a program to find the sum of all diagonal elements of a matrix.

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	3. Write a program to print the lower triangle of a matrix.			
	4. Write a program to print the maximum element from a matrix.			
4.	Implementing various data structures like stack, queue and linked list			
	Write a program to implement stack operations (PUSH, POP, PEEP, CHANGE & DISPLAY) Write a program to implement stack operations (PUSH, POP, PEEP, CHANGE & DISPLAY) Write a program to implement stack operations (PUSH, POP, PEEP, CHANGE & DISPLAY)			
	Write a program to implement queue operations (INSERT, DELETE, DISPLAY) Write a program to implement singly linked list operations (INSERT, DELETE, DISPLAY)			
5.	Implement and Analyse time complexity of Bubble and Insertion sort			
	 Write a program to sort array elements using bubble sort. Write a program to sort array elements using insertion sort. 			
6.	Implement and Analyse time complexity of Selection sort and Heap sort			
	Write a program to sort array elements using selection sort.			
	Write a program to sort array elements using heap sort.			
7.	Implementation and Time analysis of Linear and Binary search algorithm			
	1. Write a program to implement linear search algorithm.			
	2. Write a program to implement binary search algorithm.			
8.	Implement and Analyse time complexity of Quick sort and Merge sort			
	1. Write a program to implement quick sort algorithm.			
	2. Write a program to implement merge sort algorithm.			
9.	Implementation of Kruskal's and Prim's algorithms using Greedy algorithm			
	Write a program to study and implement minimum spanning tree using Kruskal's algorithm.			
	Write a program to study and implement minimum spanning tree using Prim's algorithm.			
10.	Implementation of Dijkstra's and Huffman code algorithms using Greedy algorithm			
	1. Write a program to study and implement Dijkstra's algorithm.			
	Write a program to study and implement Huffman code algorithm.			
11.	Implementation of Making a change problem and Largest Common Sub-sequence using Dynamic programming			
	Write a program to implement making a change problem using dynamic programming.			
	Write a program to implement Largest Common Sub-sequence.			
12.	Implementation of a Knapsack problem using Greedy approach and Dynamic programming			
	1. Implement knapsack problem using greedy approach			
10	2. Implement 0/1 knapsack problem using dynamic programming.			
13.	Implementation of DFS and BFS algorithms			
	Write a program to implement the DFS algorithm. Write a program to implement the DFS algorithm.			
14	Write a program to implement the BFS algorithm. Second of Bodin Vary et ing modeling algorithm. Second of Bodin Vary et ing modeling algorithm. Second of Bodin Vary et ing modeling algorithm. Second of Bodin Vary et ing modeling algorithm. Second of Bodin Vary et ing modeling algorithm. Second of Bodin Vary et ing modeling algorithm. Second of Bodin Vary et ing modeling algorithm. Second of Bodin Vary et ing modeling algorithm. Second of Bodin Vary et ing modeling algorithm. Second of Bodin Vary et ing modeling algorithm. Second of Bodin Vary et ing modeling algorithm. Second of Bodin Vary et ing modeling algorithm. Second of Bodin Vary et ing modeling algorithm. Second of Bodin Vary et ing modeling algorithm. Second of Bodin Vary et ing modeling algorithm. Second of Bodin Vary et ing modeling algorithm. Second of Bodin Vary et ing modeling algorithm. Second of Bodin Second o			
14.	Implementation of Rabin-Karp string matching algorithm			
	Write a program to implement Rabin-Karp method for pattern searching			
15.	Illustrating Various Algorithms using HTML and JavaScript			
	1. Create a visual application using HTML and JavaScript that demonstrates one of the various algorithms.			

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Miscellaneous

Useful Links

GCC, JAVA

W1: https://www2.cs.duke.edu/courses/fall10/cps130/lectures.htm W2: https://www.isical.ac.in/~arijit/courses/spring2017/daa-mtech.html

W3: http://www.cs.umd.edu/class/fal2015/cmsc451/

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