

BCSE204L Design and Analysis of Algorithms

Overview of the course

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SCOPE

About the course

BCSE204L	Design and Analysis of Algorithms	L	T	P	C
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Pre-requisite	NIL	Syllabus version			
		1.0			

- **Course Objectives:**

1. To provide mathematical foundations for analyzing the complexity of the algorithms
2. To impart the knowledge on various design strategies that can help in solving the real world problems effectively
3. To synthesize efficient algorithms in various engineering design situations

Course Outcomes

1. Apply the mathematical tools to analyze and derive the running time of the algorithms
2. Demonstrate the major algorithm design paradigms.
3. Explain major graph algorithms, string matching and geometric algorithms along with their analysis.
4. Articulating Randomized Algorithms.
5. Explain the hardness of real-world problems with respect to algorithmic efficiency and learning to cope with it.

Module:1 Design Paradigms: Greedy, Divide and Conquer Techniques

- Introduction
- Time complexity
- Proof of correctness
- Greedy techniques
 - Fractional Knapsack Problem
 - Huffman coding
- Divide and Conquer
 - Maximum Subarray
 - Karatsuba faster integer multiplication algorithm

Module:2 Design Paradigms: Dynamic Programming, Backtracking and Branch & Bound Technique

- Dynamic programming:
 - Assembly Line Scheduling
 - Matrix Chain Multiplication
 - Longest Common Subsequence
 - 0-1 Knapsack
 - TSP

Module 2 [cont..]

- Backtracking
 - N-Queens problem
 - Subset Sum
 - Graph Coloring
- Branch & Bound
 - Job Selection problem
 - 0-1 Knapsack Problem

Module:3 String Matching Algorithms

- Naïve String-matching Algorithm
- KMP algorithm
- Rabin-Karp Algorithm
- Suffix Trees

Module:4 Graph Algorithms

- All pair shortest path:
 - Bellman Ford Algorithm
 - Floyd-Warshall Algorithm
- Network Flows:
 - Maximum Flows
 - Ford-Fulkerson
 - Edmond-Karp
 - Push Re-label Algorithm
 - Application of Max Flow to maximum matching problem

Module:5 Geometric Algorithms

- Line Segments
 - Properties, Intersection, sweeping lines
- Convex Hull finding algorithms
 - Graham's Scan
 - Jarvis' March Algorithm

Module:6 Randomized algorithms

- Randomized quick sort
- The hiring problem
- Finding the global Minimum Cut

Module:7 Classes of Complexity and Approximation Algorithms

- The Class P
- The Class NP
- Reducibility and NP-completeness
- SAT (Problem Definition and statement)
- 3SAT
- Independent Set
- Clique

Module:7 Classes of Complexity and Approximation Algorithms [cont..]

- Approximation Algorithms
 - Vertex Cover
 - Set Cover
 - Travelling salesman problem

Module:8 Contemporary Issues

- Will be decided later

Study Materials

- Text books

1. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms , Third edition, MIT Press, 2009.

- Reference books

1. Jon Kleinberg, ÉvaTardos ,Algorithm Design, Pearson education, 2014
2. Ravindra K. Ahuja, Thomas L. Magnanti, and James B. Orlin, “Network Flows: Theory, Algorithms, and Applications”, Pearson Education, 2014
3. Rajeev Motwani, Prabhakar Raghavan; Randomized Algorithms, Cambridge University Press, 1995 (Online Print – 2013)

Assessment Methodologies and Rubrics

Assessment type	Due Date	Max Marks	Weightage	Remarks
Quiz-1	Before CAT1	10	10	80% of the marks, if re-quiz
CAT-1	22-01-23 to 29-01-23	50	15	
Quiz-2	Between CAT-1 and CAT-2	10	10	80% of the marks, if re-quiz
DA	Submission after CAT-2	10	10	Rubrics is given separately
CAT-2	12-03-2023 to 18-03-2023	50	15	
FAT	After 17-04-2022	100	40	

DA Rubrics

Sl No	Expected Deliverables	Weightage
1	Clarity and coverage of concepts	15%
2	Error free and plagiarism free	10%
3	Inclusion of relevant Tables and Figures	15%
4	Usage of standard notations and terminologies	10%
5	Novelty of examples	10%
6	Organisation of contents	10%
7	Level of content delivery (abstract or in-depth)	15%
8	Brevity and comprehensiveness	15%

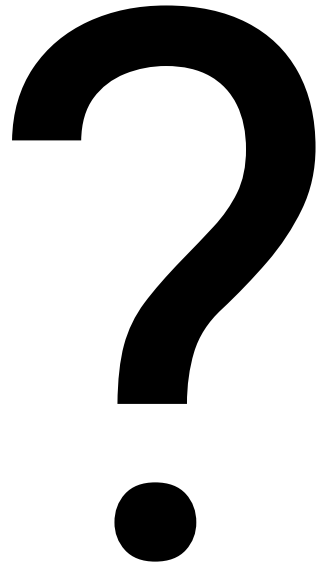
General Guidelines

- All queries will be addressed physically or through MS-Teams chat, feel free to ask (Advantage: I can easily recognize you)
- WhatsApp texting is highly discouraged and wont guarantee any reply
- **Need a single point of contact**
- All DAs must be submitted through VTOP and/or Moodle only. No other mode (such as email) is accepted
- Submit assignments well in advance to avoid probable network issues/VTOP login errors at the last moment which leads t asking for excuses

Moodle Account

- Hope it is ready for everyone.

Queries



Thank you..!!