CSE221 Lesson Plan, Summer 2025 Mid-term: July 27, 8:00 am Final:	Course Outline: https://docs.google.com/document/d/1l0ub-Dn-8wnYDPwRU2ce8NrtalaloK4-/edit?usp=sharing

Class #	Topics	Materials
0	Ice breaking	https://m.media-amazon.com/images/I/51oXcGxCoFL._AC_SX679_.jpg
1	1. Introduction: Algorithms for accuracy, efficiency (space, time); Algorithms in real world 2. Time Complexity (recap): RAM Model, Loop iterations vs execution time, Growth Functions, best-worst scenario	Iterative time complexity: https://drive.google.com/file/d/1rTgD7Vzsvd4jWFr9taPqrdttOHlHXRJY/view?usp=sharing
2	Searching algorithms 1. Binary: Logical explanation on the logarithmic time complexity, fitness/feedback function, finding upper - lower bound 2. Ternary: Concept, Advantages over binary search 3. Balancing between no. of search steps and cost of each step: why quaternary search is not that popular	Linear: https://drive.google.com/file/d/1vAJ2EbjdNmv6_ZgbEcDwDj3RnwPs7qp/view Binary: https://drive.google.com/file/d/1P6QjoYShah1YlFzdgNCRbnXd379BiuQb/view Ternary: https://drive.google.com/file/d/1tP_ebyE3uHpGto6NlcDf5-VlzUsgoyOe/view
3	Sorting algorithms 1. Case analysis on N^2 sorting algorithms: Bubble, Insertion/Selection; # of iterations, # of swaps on best/worst scenario 2. Linear (case specific) time sorting: Count sort, a good example of why nested iterations is not always multiplied for time complexity	Animated simulations from: https://visualgo.net/en/sorting
4	Sorting contd. 1. NlgN sorting: Merge, Quick (fixed and random pivots)	Merge: https://drive.google.com/file/d/1JUGTeiVhRnwaMKVcvwruklKGymlq-U25/view?usp=sharing Quick: https://drive.google.com/file/d/1vbcbOtf5jkflJBLzMbniFr3FZIvF3nbO/view?usp=sharing
5	Quiz + Lagged discussion (if any)	
6	Asymptotic Notations: upper, lower, tight bound complexity	Iterative time complexity: https://drive.google.com/file/d/1rTgD7Vzsvd4jWFr9taPqrdttOHlHXRJY/view?usp=sharing
7	Divide and Conquer (DnC) algorithms 1. Look back to merge, quick sort 2. Max-sum subarray: O(NlgN) [can also be solved in O(N^3), O(N^2), O(N)]	Max-sum subarray: https://docs.google.com/presentation/d/1rIC6OXh7W5ELsxkfGbnYWJRSv870Y3u2/edit?usp=sharing
8	DnC contd.: Karatsuba multiplication	Karatsuba: https://docs.google.com/presentation/d/1xcTFII_wxMCVomD54YsKQxytc6VfNaf3zwEsliv7jWs/edit?usp=sharing
9	Time complexity of recursive/DnC algorithms: recursion tree, substitution method, master theorem	Recursive Time complexity: https://drive.google.com/file/d/12cR_JBR8wZg0NDAIl-wzL6fUsZLYcfQM/view?usp=sharing
10	BFS: traversal (review), shortest path on unweighted graph, Bicolorable/Bipartite graph detection, cycle detection (odd or even length)	bfs dfs: https://drive.google.com/file/d/1OkLO91GV4M23e-1EtvFr9yeGWgk6V91q/view?usp=sharing
11	Quiz + Review	
Mid Semester Examination		
12	DFS: traversal (review), Edge classification, cycle detection	bfs dfs: https://drive.google.com/file/d/1OkLO91GV4M23e-1EtvFr9yeGWgk6V91q/view?usp=sharing
13	What is DAG, Topological ordering, Strongly Connected Components (SCC, Kosaraju's algo)	top sort: https://drive.google.com/file/d/1U-PVynHjD-PytCeHvcqtCsCaEE-iL-qc/view?usp=sharing SCC: https://drive.google.com/file/d/1fckjavRyW4yCAi2zmAjsF3pKhIsr3FJb/view?usp=sharing
14	Shortest path algo: What is SSSP and APSP, Dijkstra's algo, ~~Bellman-Ford Algo (Negative-weight edges in play)~~	MST+Dijkstra: https://drive.google.com/file/d/1zNpTudRm--5wPHKrownXyosZQ1ta69F3/view?usp=sharing
15	MST: Kruskal's (+DSU)	MST+Dijkstra: https://drive.google.com/file/d/1zNpTudRm--5wPHKrownXyosZQ1ta69F3/view?usp=sharing
16	Quiz + Lagged discussion (if any)	
17	Greedy: Huffman coding, ~~Interval scheduling (covered in lab before mid)~~	Greedy Basics, time scheduling: https://drive.google.com/file/d/1U-LLjWQHP-RdARYV8vOYlMkKglZBFzd4/view?usp=sharing Huffman: https://drive.google.com/file/d/1-_oOWBKQARdaWgZvLTUFlV5tCYd5CqZ4/view?usp=sharing
18	Backtracking Algorithms: 8 queen Problem	
19	Backtracking Algorithms: 15 puzzle Problem	
20	DP-1: Fractional vs 0-1 Knapsack	fractional knapsack: https://drive.google.com/file/d/1U-LLjWQHP-RdARYV8vOYlMkKglZBFzd4/view?usp=sharing DP Basics, 0-1 knapsack: https://drive.google.com/file/d/1tdh2T7G4L4uMVuLnxvqHhJqVxku8nnoN/view?usp=sharing
21	DP-2: LCS, Recurrence relation, Properties: overlapping subprob and opt. substructure	LCS: https://drive.google.com/file/d/1YJonhR6glZoGMLk0G6323MJytohlIvn6/view?usp=sharing
22	Quiz + Review	
Final Examination		

Marks Distribution	Quiz: 20 (best 3 out of 4, or as instructed by course teacher) Assignment: 05 (4 assignments) Mid Semester Exam: 20 Final Exam: 30 Lab: 25