

Weekly Schedule Fall 2022

Please note that this schedule is not final and may vary slightly between sections

	DATE	TOPICS	CONTENTS
WEEK 0	Sept 9 th	1. Course Introduction, Administrivia	0-0 Course Info 0-1 Course History 0-2 HW Submission
WEEK 1	Sept 12 th	1. Asymptotics 2. Logarithms, Summations 3. Induction, Contradiction	1-1 Asymptotics Intro 1-2 Big Oh 1-3 Big Omega 1-4 Theta Asymptotics 1-5 Asymptotics Properties 2-1 Logarithms 2-2 Summations 3-1 Induction 3-2 Induction 3-3 Contradiction
WEEK 2	Sept 19 th	1. Recurrences 2. Graphs, Trees 3. Permutations, Combinations	4-1 Recurrences Mergesort 4-2 Recurrences Master Theorem 4-3 Recurrences Substitution 4-4 Recurrences Tree 2-3 Intro to Graphs 2-4 Intro to Trees 5-1 Rules of Sum and Product 5-2 Permutations 5-3 Combinations
WEEK 3	Sept 26 th	1. Probability 2. Heaps, Heapsort 3. Quicksort (1) Homework 1 Due (Sept 30)	6-1 Probability Introduction 6-2 Discrete Random Variable 7-1 Introduction to Heapsort 7-2 Heap Operations 7-3 Heapsort 7-4 Heap Runtime and Priority Queue 8-1 Quicksort Introduction 8-2 QS Basic Analysis

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WEEK 4	Oct 3 rd	<ol style="list-style-type: none"> 1. Quicksort (2) 2. Counting Sort, Radix Sort 3. Selection Sort, Binary Search Trees 	8-3 QS Worst Case 8-4 Randomized QS 9-1 Lower Bound on Sorting and Counting Sort 9-2 Radix Sort 10 Selection Sort 11-1 Binary Search Trees Intro 11-2 Binary Search Trees Operations
WEEK 5	Oct 10 th	<ol style="list-style-type: none"> 1. Thanksgiving (no classes) 2. Red Black Trees 3. Hash Tables, Hashing <p>Homework 2 Due (Oct 14)</p>	12-1 Red Black Trees Properties 12-2 Red Black Trees Balance Proof 12-3 Red Black Trees Operations 13-1 Motivation for Hash Tables 13-2 Introduction to Hash Tables 13-3 Resolution by Chaining 13-4 Resolution by Open Addressing
WEEK 6	Oct 17 th	<ol style="list-style-type: none"> 1. Dynamic Programming (1) 2. Dynamic Programming (2) 3. Greedy Algorithms (1) 	14-1 Introduction to Dynamic Programming 14-2 DP Matrix Multiplication 14-3 DP Longest Common Subsequence 15-1 Greedy Algorithms Introduction & Class scheduling 15-2 Knapsack problem
WEEK 7	Oct 24 th	<ol style="list-style-type: none"> 1. Greedy Algorithms (2) 2. Amortized Analysis 3. Splay Trees (1) <p>Homework 3 Due (Oct 28)</p>	15-3 Introduction to Huffman Encoding 15-4 Huffman proofs 16-1 Amortized Analysis Introduction 16-2 Aggregate Method 16-3 Accounting Method 17-1 Splay Trees Definitions
WEEK 8	Oct 31 st	<ol style="list-style-type: none"> 1. Splay trees (2) 2. Graph Algorithms 3. Minimum Spanning Trees <p>Midterm Exam (TBD)</p>	17-2 Cost of Splay and Operations 17-3 Proof of Splay Claim 22-1 Graph Algorithms Intro and Breadth-First Search 22-2 Depth-First Search 22-3 Topological Sort 22-4 Strongly Connected Components 23-1 Minimum Spanning Trees Intro 23-2 Generic Algorithm and Correctness Proof 23-3 Prim's Algorithm

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	Nov 7 th	Reading Week (no classes)	
WEEK 9	Nov 14 th	1. Shortest Paths (1) 2. Shortest Paths (2) 3. Maximum Flow (1)	24-1 Shortest Paths Intro and Properties 24-2 Dijkstra's Algorithm 24-3 Bellman-Ford 24-4 Difference Constraints 18-1 Max Flow Definitions 18-2 Max Flow Math 18-3 More Definitions and Ford Fulkerson Introduction 18-4 Ford Fulkerson and Edmonds Karp
WEEK 10	Nov 21 st	1. Maximum Flow (2) 2. History of Computing 3. Turing Machines Homework 4 Due (Nov 25)	18-5 Maximum Bipartite Matching 19 History of Computing 25-1 Theory of Automata 25-2 Regular Languages and DFAs 25-3 Turing Machines
WEEK 11	Nov 28 th	1. P, NP, and NPC Introduction 2. NPC (1) 3. NPC (2)	20-1 Introduction to NPC 20-2 Class P 20-3 Polynomial Time Verification 20-4 NP Reducibility 20-5 Class NP 20-6 NPC Definition 21-1 NPC Formula Sat 21-2 & 21-3 CNF SAT 21-3 Clique
WEEK 12	Dec 5 th	1. NPC (3) 2. NPC (4) Introduction to Blockchain (Not part of final exam material) Homework 5 Due (Dec 8)	21-4 Vertex Cover 21-5 Travelling Salesman Problem 26-1 Introduction to Blockchain 26-2 Blockchain Cryptography 26-3 Blockchain Bitcoin 26-4 Blockchain Ethereum

Final Exam