Lecture 15

- Final
- Chapter 1-4
- Chapter 6-9
- Chapter 1—12
- Chapter 15-16
- Chapter 19
- Chapter 22-26
- Chapter 34
Analysis

- Algorithm Analysis
- Need to know:
  - How to compute complexity of an algorithm.
  - Big $O$/Theta/Omega notation
  - Complexities of various algorithms from class
Chapter 10-12

- Basic Data Structures
- Stacks & Queues
  - Linked structure implementation
  - Array-based implementation
- Vectors, Lists, & Sequences
  - Implementations
  - Interfaces
Cont’d

• Trees
  • Definitions - height, depth, proper, binary
  • Classes of nodes - internal, external
  • Traversals - in-order, pre-order, post-order

• Priority Queues
  • Interface
  • Implementations

• Heaps
  • Heap properties - what is a heap
  • Implementation
Cont’d

• Dictionaries
  • Interfaces
  • Implementations
• Hash tables
  • Interfaces
  • Implementations
Chapter 12

- Binary Search Trees
  - Basic operations (insert, remove, search)
  - Complexity
- Skip lists
Chapter 6/7/8/9

- Heap Sort
- Merge Sort
- Quick Sort - be aware of worst case behavior
- Radix Sort
- Lower bound on comparison sort complexity
- Advantages/disadvantages of each sorting algorithm
- Selection problem (find the ith smallest item in list of unsorted items)
Chapter 15/16

- Greedy Algorithms
  - Fractional Knapsack Problem
  - Activity Selection Problem
- Dynamic programming - know the various results
  - Matrix Chain Multiplication Problem
  - 0-1 Knapsack Problem
Chapter 22

- Graphs - basic definitions DAGS/Directed/Undirected/...
- Data Structures to store graph (adjacency list/matrixes)
- Directed Graphs
- Depth First Search
- Breadth First Search
Chapter 23, 24, 25

- Single Source Shortest Path
  - Bellman Ford
  - Shortest path in DAG
  - Dijkstra
- All Pairs Shortest Path
  - Matrix-base Algorithm
  - Floyd-Warshall Algorithm
  - Johnson’s Algorithm
- Minimum Spanning Trees
  - Prim’s
  - Baruvka’s
  - Kruskal’s
Chapter 26

- Network Flows
  - Statement of problem
  - Structure of graph (Source can’t have incoming edges, Sink can’t have outgoing edges)
  - Network Cut Definition
  - Theorem for Cuts, Augmenting Paths, and Max Flow
- Maximum Flow
  - Relation between network cut/max flow
  - Definitions
  - Ford Fulkerson Method
  - Edmonds-Karp Algorithm
- Maximum Bipartite Matching
Chapter 34

- P vs. NP
- NP Completeness
- NP Complete Problem