

Northeastern University
 College of Computer and Information Science
 Algorithm (CS5800) – Fall 2018

Textbook

[KT] Kleinberg and Tardos: *Algorithm Design*, Pearson/Addison-Wesley
 Lecture slides available at:
<http://www.cs.princeton.edu/~wayne/kleinberg-tardos/>

Other References

[LLM] Lehman, Leighton, Meyer: *Mathematics for Computer Science*, MIT
<https://courses.csail.mit.edu/6.042/spring17/mcs.pdf>

[CLRS] Cormen, Leiserson, Rivest, Stein: *Introduction to Algorithms*
 McGraw Hill, MIT Press

[DPV] Dasgupta, Papadimitriou, and Vazirani: *Algorithms*
 McGraw-Hill Education

Approximate Schedule: (Subject to change over the semester)

Unless otherwise noted, all readings in the table refer to Kleinberg-Tardos.

Lecture	Topics	Reading
Unit 1: Introduction to Design and Analysis of Algorithms		
1: Sep 7, 2018	Course Overview; Stable Matching Problem	Ch. 1
2: Sep 11, 2018	A Primer on Proofs	[LLM] Ch.1,2,5
3: Sep 14, 2018	Asymptotic Notation	Ch. 2
Problem Set 1	Out on Tuesday, 9/11; Due on Friday 9/21	
Unit 2: Divide and Conquer		
4: Sep 18, 2018	Merge Sort; Recurrence Relations	5.1
5: Sep 21, 2018	Recurrence Relations (contd.); Master Theorem	5.2
Problem Set 2	Out on Friday, 9/21; Due on Tuesday 10/2	
6: Sep 25, 2018	Selection: Deterministic Algorithm	
7: Sep 28, 2018	Quiz 1 – 9/28 (Units 1 and 2) Selection: Randomized Algorithm	13.3, 13.5
8: Oct 2, 2018	Closest Pair	5.4, 13.7
Problem Set 3	Out on Tuesday, 10/2; Due on Friday 10/12	
Unit 3: Basic Data Structures		

9: Oct 5, 2018	Hashing, Binary Search Trees, and Priority Queues	2.5, 13.6
Unit 4: Graph Traversals		
10: Oct 9, 2018	Graph Definitions, Traversals; Breadth-First Search	3.1-3.3
11: Oct 12, 2018	Depth-First Search; Topological Sorting	3.4-3.6
Oct 12, 2018	MID-TERM EXAM (Units 1 through 3) , Time TBD	
12: Oct 16, 2018	Strongly Connected Components	3.5
Unit 5: Greedy Algorithms		
Prog. Assignment 1	Out on Friday, 10/19; Due on Tuesday, 11/6	
13: Oct 19, 2018	Task Scheduling	4.1
14: Oct 23, 2018	Huffman Encoding	
Problem Set 4	Out on Tuesday, 10/23; Due on Friday 11/2	
Unit 6: Minimum Spanning Trees		
15: Oct 26, 2018	Kruskal's Algorithm for MST Quiz 2 – 10/26 (Units 4 and 5)	5.1
16: Oct 30, 2018	Prim's Algorithm	5.2
Unit 7: Dynamic Programming		
17: Nov 2, 2018	Weighted Task Scheduling; Longest Common Subsequence	6.1
18: Nov 6, 2018	Knapsack	6.4
19: Nov 9, 2018	Quiz 3 – 11/9 (Unit 6) More Dynamic Programming Examples	6.5-6.6
Problem Set 5	Out on Friday 11/2; Due on Tuesday 11/13	
Unit 8: Shortest path		
20: Nov 13, 2018	Shortest paths in DAGs; Dijkstra's Algorithm	4.4
21: Nov 16, 2018	Bellman-Ford algorithm; Floyd-Warshall algorithm	6.8
Nov 16, 2018	MID-TERM EXAM 2 – (units 4-7) Time TBD	
Unit 9: Network Flows		
22: Nov 20, 2018	Flows and cuts; Ford-Fulkerson's algorithm	7.1-7.3
23: Nov 27, 2018	Edmonds-Karp; Applications of network flows	7.4-7.6
24: Nov 30, 2018	More applications of network flows	7.11
Problem Set 6	Out on Tuesday, 11/20; Due on Friday, 11/30	
Prog. Assignment 2	Out on Tuesday, 11/20; Due on Friday, 12/7	
Unit 10: NP-Completeness		
25: Dec 4, 2018	Hard Decision Problems; Polynomial-time Reductions Quiz 4 – 12/4 (Units 8 and 9)	8.1-8.2
26: Dec 7, 2018	Cook's Theorem; NP-completeness proofs	8.3-8.7
Final Exam – Week of Dec 10th – 14th		