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## Course Outline

### September

Wed	3	<b>Lecture 1</b> Administrivia. Introduction: analysis of algorithms, insertion sort. <i>Reading:</i> Chapter 1, 2.1, 2.2.	Reg. out. Reg. due 4:30pm
Fri	5	<b>Recitation 1</b> Correctness of algorithms. <i>Reading:</i> Kingston chapter.	PS 1 out.
Mon	8	<b>Lecture 2</b> Asymptotic notation. Recurrences: substitution, iteration, master method. <i>Reading:</i> Chapters 3–4, excluding Section 4.4.	
Wed	10	<b>Lecture 3</b> Divide and conquer: merge sort, Strassen’s algorithm, polynomial and integer multiplication. <i>Reading:</i> 2.3, 28.2, and 30.1	
Fri	12	<b>Recitation 2</b> Recurrences, Divide and conquer examples.	PS 1 due. PS 2 out.
Mon	15	<b>Lecture 4</b> Randomized algorithms: quicksort. <i>Reading:</i> 5.1-5.3; Chapter 7.	
Wed	17	<b>Lecture 5</b> Sorting Lower Bounds, Linear time sorting, counting sort, radix sort. <i>Reading:</i> Sections 8.1-8.3	
Fri	19	<b>Recitation 3</b> Sorting: heapsort, priority queues, dynamic sets. <i>Reading:</i> Chapter 6	
Mon	22	Student Holiday–No class	
Wed	24	<b>Lecture 6</b> Median and order statistics <i>Reading:</i> Chapter 9	PS 2 due. PS 3 out.
Fri	26	<b>Recitation 4</b> Bucket Sort; Applications of median.	
Mon	29	<b>Lecture 7</b> Hashing <i>Reading:</i> 11.1-11.3	

### October

Wed	1	<b>Lecture 8</b> Binary search trees, tree walks, relation to quicksort. <i>Reading:</i> Sections 12.1–12.3	
Fri	3	<b>Recitation 5</b> Quiz 1 Review. ADD DATE.	
Mon	6	<b>Lecture 9</b> Balanced search trees: AVL, Red-Black Trees. <i>Reading:</i> Chapter 18.1–18.2	PS 3 due.
Wed	8	QUIZ 1: in-class test.	PS 4 out.
Fri	10	<b>Recitation 6</b> Additional balanced search trees. <i>Reading:</i> Chapter 13.	
Mon	13	Columbus Day–No class	
Wed	15	<b>Lecture 10</b> Augmenting data structures: dynamic order statistics, interval trees. <i>Reading:</i> Chapter 14.	
Fri	17	<b>Recitation 7</b> Examples of augmentation. <i>Reading:</i> Chapter 14.	
Mon	20	<b>Lecture 11</b> Greedy algorithms: minimum-spanning trees, Prim’s and Kruskal’s algorithms. <i>Reading:</i> Sections 16.1–16.3, Chapter 23.	
Wed	22	<b>Lecture 12</b> Dynamic programming: optimal binary search trees, longest common subsequence. <i>Reading:</i> Chapter 15.	PS 4 due. PS 5 out.
Fri	24	<b>Recitation 8</b> Examples of greedy algorithms and dynamic programming.	
Mon	27	<b>Lecture 13</b> Amortized analysis: table doubling, potential method. <i>Reading:</i> Chapter 17.	
Wed	29	<b>Lecture 14</b> Graph algorithms: depth-first search, topological sort, strongly-connected components. <i>Reading:</i> Sections 22.3–5.	
Fri	31	<b>Recitation 9</b> Competitive Analysis, self-organizing lists.	PS 5 due. PS 6 out.

**November**

Mon	3	<b>Lecture 15</b> Graph algorithms: single-source shortest paths, Dijkstra's algorithm, Bellman-Ford algorithm. <i>Reading:</i> Sections 25.1–3.	
Wed	5	<b>Lecture 16</b> Graph algorithms: all-pairs shortest paths, matrix multiplication, Floyd-Warshall algorithm, difference constraints. <i>Reading:</i> Sections 25.1, 25.2.	
Fri	7	<b>Recitation 10</b> Graph algorithms. <i>Reading:</i> Chapters 23–26	
Mon	10	Veterans Day–No class	
Wed	12	<b>Lecture 17</b> Matching algorithms. <i>Reading:</i> Section 26.3.	
Fri	14	<b>Recitation 11</b> Quiz 2 Review. <i>Reading:</i> Section 26.3.	PS 6 due. PS 7 out.
Mon	17	<b>Lecture 18</b> Network flow: max-flow min-cut, Ford-Fulkerson algorithm, augmenting paths. <i>Reading:</i> Sections 26.1–2.	
Wed	19	In class quiz	
Fri	21	<b>Recitation 12</b> Network Flow, Bipartite Matching. <i>Reading:</i>	
Mon	24	<b>Lecture 19</b> Computational Number Theory. <i>Reading:</i> Sections 31.1-31.5.	
Wed	26	<b>Lecture 20</b> Computational Number Theory, RSA, Probabilistic Algorithms, Primality. <i>Reading:</i> Section 31.7,31.8.	PS 7 due. PS 8 out.
Fri	28	Thanksgiving–No class	
<b>December</b>			
Mon	1	<b>Lecture 21</b> Fast Fourier Transform, Integer Multiplication. <i>Reading:</i> Sections 30.1,30.2.	
Wed	3	<b>Lecture 22</b> Complexity: P vs. NP, efficient verification. <i>Reading:</i> Sections 34.1, 34.2.	

Fri	5	<b>Recitation 13</b> FFTs and basic NP-completeness notions	PS 8 due. PS 9 out.
Mon	8	<b>Lecture 23</b> NP-completeness 1, Polynomial time reductions. <i>Reading:</i> Chapter 34.3–34.5.	
Wed	10	<b>Lecture 24</b> NP-Completeness and approximation algorithms. <i>Reading:</i> Chapter 35.1.	
Thur	18	FINAL EXAM	9:00–12:00 duPont