

CS166 Syllabus

Below is a (tentative) syllabus for this quarter's offering of CS166. It might change a bit if we move through some of the topics faster or more slowly than anticipated or if people have suggestions for other topics to cover.

Date	Topics	Assignments
<i>Part One: Preprocessing / Runtime Tradeoffs</i>		
T April 3	<i>Why study data structures?</i> Range Minimum Queries, Part I	Problem Set 0 Out
Th April 5	<i>How to solve lots of small problems quickly.</i> Range Minimum Queries, Part II The Method of Four Russians	
<i>Part Two: String Data Structures</i>		
T April 10	<i>Automata Theory to the Rescue!</i> Tries Aho-Corasick String Matching	Problem Set 0 Due Problem Set 1 Out
Th April 12	<i>A substring is a prefix of a suffix.</i> Suffix Trees Amazingly Simple String Algorithms	
T April 17	<i>Memory is important. Divide-and-conquer is weird.</i> Suffix Arrays Constructing Suffix Trees	Problem Set 1 Due Problem Set 2 Out
<i>Part Three: Data Structure Isometries</i>		
Th April 19	<i>Modeling one data structure with another.</i> 2-3-4 Trees Red/Black Trees	
T April 24	<i>BSTs are way cooler than they look.</i> Augmented Binary Search Trees Tree Splits and Joins	Problem Set 2 Due Problem Set 3 Out
<i>Part Four: Amortized Analysis</i>		
Th April 26	<i>A little accounting trickery never hurt anyone, right?</i> Two-Stack Queues A Better 2-3-4 Tree Analysis	
T May 1	<i>From arithmetic to data structures.</i> Binomial Heaps Lazy Binomial Heaps	
Th May 3	<i>Yet another "balance two competing tensions" solution.</i> Fibonacci Heaps Asymptotically Optimal Dijkstra's and Prim's Algorithms	Problem Set 3 Due

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T May 8	<i>In search of the best possible binary search tree!</i> Splay Trees Static and Dynamic Optimality.	Problem Set 4 Out
<i>Part Five: Randomized Data Structures</i>		
Th May 10	<i>Counting without counting.</i> Count[-Min] Sketches Universal and Pairwise-Independent Hashing	
T May 15	<i>A simple data structure with a legendary analysis.</i> Linear Probing Concentration Inequalities	
Th May 17	<i>Brood parasites, English nobility, and dynamic perfect hashing.</i> Worst-Case Efficient Hash Tables Cuckoo Hashing	Problem Set 4 Due Problem Set 5 Out
<i>Part Six: Integer Data Structures</i>		
T May 22	<i>Combining integers, tries, cuckoo hashing, and split/join!</i> <i>x</i> -Fast and <i>y</i> -Fast Tries Exponentially Faster Ordered Dictionaries	
Th May 24	<i>Parallel processing with machine words!</i> Fusion Trees Word-Level Parallelism	Problem Set 5 Due
<i>Part Seven: Graph Data Structures</i>		
T May 29	<i>Where does the Ackermann function come from?</i> Disjoint-Set Forests Slicing Forests for Fun and Profit	
	Midterm Exam Covers topics from PS1 – PS5 7:00PM – 10:00PM, Location TBA	
Th May 31	<i>Connectivity in a changing world.</i> Euler Tour Trees Dynamic Graphs	
<i>Part Eight: The Big Picture</i>		
T June 5	<i>Where to go from here!</i> What's next in data structures? What else do you want to know?	