dont know	know a bit	OK	good!	master	COMS 311 TOPICS			
1	2	3	4	5	**BIG-OH**	**week3**	week2	week1
					Basics			x
					Definitions of big-oh, omega, theta c>0, n>=0 (7 things)			x
					big-omega			x
					big-theta			x
					Intuition/understanding (graph)			x
					tighter and weaker bounds		x	x
					how to prove O/Omega/Theta techniques			x
					for polynomials choose c >sum of coeff or coeff for omega			x
					for same type compare exponents			x
					take log			x
					Application to Algorithms			x
					ram model (vs actual)			x
					instances and runtime graphs		x	x
					WCET, BCET, ACET		x	x
					Big-oh of code segments		x	x
					problem complexity and algorithmic complexity			x
					code examples of different Os			x
					Big-oh in real world		x	
					real code times (matrix mult)		x	
					effect of cache/pipelining etc		x	
					choosing algo in real-world vs big-Oh		x	
					constants might matter more in real world than O		x	
					easier implementation might make the diff		x	
					Dominance Relationships			x
					logs beat constants			x
					poly beats all logs			x
					exp beats all poly			x
					fact beats all exp			x
					n^n beats fact			x
1	2	3	4	5	**DATA STRUCTURES**			
					Basic		x	x
					arrays (sorted/unsorted)		x	x
					linked lists (singly/doubly; sorted/unsorted)		x	x
					comparison of arrays and linked lists		x	x
					Basic Abstract Data Types		x	x
					Stack, Queue (implementations using array/linkedlists)		x	x
					comparison of operations of diff impl of stack/queue		x	x
					reasons for differences		x	x
					Dictionaries	x	x	

						Hash Tables	x	x	
					Other ADTs and their Java Implementations		x	x	
						Binary Search Trees	x	x	
						Priority Search Queues	x	x	
						Heap impl	x	x	
					Storing points, graphs, sets etc		x	x	
						graphs	x	x	
						sets	x	x	
					big-oh of operations on data structures		x	x	
					algorithms on data structures (BST, HEAP etc)		x	x	
1	2	3	4	5	**P-NP**				
					Intro Concepts				x
						the diagram and four classes of problems			x
						informal (solvable, probab intract, provably intract, prov unsolvable)			x
						examples of problems in four classes			x
						Halting Problem			x
						Hamiltonian Cycle Enumeration problem			x
						Hamiltonian Cycle Search problem			x
						Independent Set problem			x
						Search/Sort problems			x
					Classes of problems				
						Undecidable (prove Halting problem is undecidable)			x
						P			x
						NP			x
						prove P is a subset of NP			
						NP-Complete (probably intractable class)			x
						why if a NP-C problem is in P, then P=NP			
						provably intractable classes			x
						NP-Hard problems			
					Reduction				
						optimization, search, decision and reductions			
						definition of polynomial-time reduction & notation			
						conclusions (or implications of) from Y <=p X			
						transitive property (x <=p y, y <=p z => x<=p z)			
						how to prove X <=p Y (the three steps)			
						interval sched <=p IS			
						vector cover <=p IS			
						IS <=p vector cover			
						bipartite matching <=p IS			
					NP-Complete				

						Definition and Intuition			
						The first NP-C problem (circuitSAT) & Cook-Levin's theorem			
						how to prove that a problem is NP-C			
						prove 3-SAT is NP-C			
						prove IS is NP-C			
						prove VC is NP-C			
1	2	3	4	5	**PROOF TECHNIQUES**				
					Why is proving important?				x
						Job selection problem			x
						solutions to JS problem			x
						why is proving so important?			x
					CALCULUS				PreReq
						propositional logic rules			PreReq
						predicate logic rules			PreReq
						form of deduction proofs			PreReq
					DIFFERENT TECHNIQUES			x	PreReq
						contradiction (and correct form)	x	x	PreReq
						induction (form)		x	PreReq
						direct proof (see form of deduction proofs)		x	PreReq
						trivial/vacuous		x	PreReq
						contrapositive		x	PreReq
					EXAMPLES IN CLASS				PreReq
						contradiction (and correct form)	x		PreReq
						induction (form)			PreReq
						direct proof (see form of deduction proofs)			PreReq
						trivial/vacuous			PreReq
						contrapositive			PreReq
					Proofs in class				
						Halting problem is undecidable		x	PreReq
						VC <=p IS and IS <=p VC			
						select jobs satisfies greedy choice + opt substructuring			
					Proving Code correct				
						Loop invariants			
						proof of recursive codes..			
1	2	3	4	5	**ALGORITHMIC TECHNIQUES**				
					BRUTE FORCE TECHNIQUES				
						search space for different problems		x	x
						recursion tree for brute force approach		x	x
						back track algo from text book		x	x
						iterative way to generate all subsets			

						recursive way to generate all subsets		x	x
						recursive way to generate all perms		x	x
						recursive way to gen size k subsets		x	x
					DIVIDE AND CONQUER				
						recurrence formula	x		
						divide and conquer approach	x		
						mergesort + analysis	x		
						quicksort + analysis	x		
						max	x		
						max sum of sequence			
						counting inversions			
						finding sink in graph			
					Recurrence Formulae		x		
						general form of recurrence formula & masters theorem	x		
						how to derive recurrence tree, term for each level, sum	x		
						2T(n/2) + c	x		
						T(n/2) + cn	x		
						2T(n/2) + cn	x		
						3T(n/2) + cn	x		
						2T(n/2) + cn^2	x		
						5T(n/2) + cn^2	x		
					GREEDY TECHNIQUE				
						greedy approach			
						interval scheduling by greedy approach			
						greedy choice property			
						optimal substructuring property			
						proving gc property			
						proving os property			