CS181 Spring 2021			Required Text: Introduction to the Theory of Computation, Third Edition, Michael Sipser, Cengage Learning
Week	**Date**	**Topics**	**Sipser sections, pages (approx.)**
1	Tue Mar 30	Preliminaries & Motivation; Discrete Math, Strings & Formal Languages; Models of computation	0.2-0.4, pp 3-24
		Introduce Deterministic Finite Automata (DFA) Model & Finite State Languages (FSLs)	1.1, pp 31-44
	Thu Apr 1	More Math Objects for CS Theory; More Examples of DFAs & FSLs	1.1, pp 37-43
		Formalize DFA model; Example of Non-FSL (provably)	1.1, pp 35-37
2	Tue Apr 6	Intro to Families of Languages and Closure Properties of Families of Languages	1.1, pp 44-47; 1.2 58-63 Th 1.25, pp 45-47 + footnote 3
		Nondeterministic FA (NFA) model: 3 Interpretations Show union via composition of 2 DFAs into 1 NFA	1.2, pp 47-54 Th 1.45, pp 59-60
	Thu Apr 8	Regular Expressions	1.4, pp 77-82
		Pumping Lemma for FSLs and Application for Proving a Language is not a FSL	1.3, pp 63-76
		Recognizers vs. Generators vs. Transducers (time permitting)	Exer 1.24, p 87
3	Tue Apr 13	Intro to Context Free Grammars (CFGs) & CF Languages (CFLs); Derivations, Parse Trees, & Ambiguity	2-2.1, pp 101-110
		Start on Proofs that DFA, NFA, & Reg. Exp. are Equivalent Representations of the Family of FSLs	1.2, pp 54-76
		Generalized NFA (GNFA)	1.3, pp 69-76
	Thu Apr 15	Examples of CFLs and Non-CFLs; Design Patterns for CFGs	2-2.1, pp 101-110
		Prove Pumping Lemma for FSLs	1.4, pp 78-79
4	Tue Apr 20	Constructions for DFAs & NFAs	Exer 1.14a, p 85
		Prove NFA = GNFA = Regular Expressions	1.3, pp 66-76
	Thu Apr 22	Review Application of Pumping Lemma for FSLs	-
		Closure Properties of CFLs	-
5	Tue Apr 27	(Nondeterministic) Push-Down Automata (PDA)	2.2, pp 111-116
	Thu Apr 29	Closure Properties of FSLs and CFLs and Applications	-
		Pumping Lemma for CFLs and Application for Proving a Language is not a CFL	Th 2.34, pp 125-129
		Intro to Deterministic PDAs (DPDAs) and Deterministic CFLs (DCFLs)	2.4, pp 130-151
6	Tue May 4	Prove Pumping Lemma for CFLs	Th 2.34, pp 125-129
	Thu May 6	Closure Properties of DCFLs vs. CFLs	-
		Normal Forms for CFGs	2.1, pp 108-110
		Begin Prove PDAs = CFLs	2.2, pp 177-124
7	Tue May 11	Finish Prove PDAs = CFLs	2.2, pp 177-124
		Deterministic CF Grammars (DCFG) (time permitting)	2.4, pp 133-135
		Application of DCFGs to Compiler Construction (time permitting)	2.4, pp 151-154
		Intro to (Deterministic) Turing Machines (TMs)	3.1, pp 165-175
	Thu May 13	Church-Turing Thesis	Fig 3.22, p 183
		Formal Computability Theory: Algorithms (Always Halting TMs) and Procedures (General TMs)	3.3, pp 182-184; 3.1, p 170
		Recursive Languages and Recursively Enumerable (RE) Languages	4.1, pp 193-210
		The Halting Problem	5.1, pp 216-218
8	Tue May 18	Universal Turing Machine	Th 4.11, p 202
	Thu May 20	Constructions for TM Algorithms and TM Procedures	-
9	Tue May 25	Review Mathematical Foundations: Countable vs. Uncountable Infinities	4.2, pp 202-206
		Non- Recursively Enumerable Languages	4.1-2, pp 193-214
	Thu May 27	Variants of TMs: Nondeterministic TMs and Other Models	3.2, pp 176-180
		Goedel's Theorem (time permitting) [maybe move after P=NP vs after NRE]	6.3, 258-259
10	Tue Jun 1	Introduce Complexity Theory	7.1, pp 275-284
		The "P=NP?" Problem	7.2-7.3, pp 284-298
	Thu Jun 3	Reductions and Completeness	7.4, pp 299-311
		NP-Complete Problems	7.4, pp 304-322
F		**Final Exam: None**	