CSE 322: Formal Models in Computer Science **Final Topics**

The final will be Monday, June 9 from 2:30-4:20 in EEB 045. It will be 110 minutes in length and will be closed book. It will cover everything in the class with slightly more coming from the material from Chapter 2 onward.

1. Strings and languages. Operations on languages.
2. Deterministic finite automata: formal definition, state diagrams, δ^*, the language of a DFA
3. Nondeterministic finite automata: formal definition, state diagrams, ε transitions, the language of a NFA
4. Converting NFAs to DFAs by the subset construction
5. Closure properties of regular operations (complement, intersection, union, star, etc)
6. Regular expressions and their languages
7. Construction of a regular expression representing the language accepted by an NFA
8. Construction of a NFA which recognizes the language of a regular expression
9. The pumping lemma. Proving that a language is not regular using the pumping lemma.
10. Pattern matching via a finite automata.
11. The Myhill-Nerode theorem and the equivalence relation $\equiv_L$ for a language L. How to prove a language not regular using the Myhill-Nerode theorem.
12. Minimization of DFAs.
13. Context-free grammars and languages: Formal definitions, derivations and parse trees, ambiguity.
14. Chomsky normal form: converting arbitrary CFG to Chomsky normal form.
15. Pushdown Automata: Formal definitions.
16. Every CFL is accepted by some PDA. Construction of PDA for CFL.
17. The fact that languages accepted by PDAs are CFLs.
18. Closure properties of CFL's
19. Pumping Lemma for CFL's: Proofs that languages are not CFL's.
20. The Cocke-Kasami-Youger algorithm for testing membership of a string in $O(n^3)$ time.

21. Diagonalization and countability.

22. The fact that certain natural properties of programs, such as the halting problem, are not decidable by any program.

A sample final is available on the website. A review session will be held on Thursday, June 5, 5:30-7:30 in EEB 125