# CS 341

## Dr. Baker

# Fall 200?

For late-breaking information and news related to the class, see http://www.cs.utexas.edu/users/dbaker/cs341/

### Acknowledgements:

This material was assembled by Elaine Rich, who allowed me to use it wholesale. I am greatly indebted to her for her efforts.

### Table of Contents

### I. Lecture Notes

### A. Overview and Introduction

- 1. The Three Hour Tour Through Automata Theory
- 2. What is a Language?

#### B. Regular Languages and Finite State Machines

- 3. Regular Languages
- 4. Finite State Machines
- 5. Nondeterministic Finite State Machines
- 6. Interpreters for Finite State Machines
- 7. Equivalence of Regular Languages and FSMs
- 8. Languages that Are and Are Not Regular
- 9. A Review of Equivalence Relations
- 10. State Minimization
- 11. Summary of Regular Languages and Finite State Machines

#### C. Context-Free Languages and Pushdown Automata

- 12. Context Free Grammars
- 13. Parse Trees
- 14. Pushdown Automata
- 15. Pushdown Automata and Context-Free Languages
- 16. Grammars and Normal Forms
- 17. Top Down Parsing
- 18. Bottom Up Parsing
- 19. Languages that Are and Are Not Context Free

### D. Recursively Enumerable Languages, Turing Machines, and Decidability

- 20. Turing Machines
- 21. Computing with Turing Machines
- 22. Recursively Enumerable and Recursive Languages
- 23. Turing Machine Extensions
- 24. Problem Encoding, Turing Machine Encoding, and the Universal Turing Machine
- 25. Grammars and Turing Machines
- 26. Undecidability
- 27. Introduction to Complexity Theory

### II. Homework

### A. Review

1. Basic Techniques

### B. Regular Languages and Finite State Machines

- 2. Strings and Languages
- 3. Languages and Regular Expressions
- 4. Deterministic Finite Automata
- 5. Regular Expressions in UNIX
- 6. Nondeterministic Finite Automata
- 7. Review of Equivalence Relations
- 8. Finite Automata, Regular Expressions, and Regular Grammars
- 9. Languages that Are and Are Not Regular
- 10. State Minimization

### C. Context-Free Languages and Pushdown Automata

- 11. Context Free Grammars
- 12. Parse Trees
- 13. Pushdown Automata
- 14. Pushdown Automata and Context-Free Grammars
- 15. Parsing
- 16. Languages that Are and Are Not Context-Free

### D. Recursively Enumerable Languages, Turing Machines, and Decidability

- 17. Turing Machines
- 18. Computing with Turing Machines
- 19. Turing Machine Extensions
- 20. Unrestricted Grammars
- 21. Undecidability

#### E. Review

22. Review

### III. Supplementary Materials

- The Three Hour Tour through Automata Theory
- Review of Mathematical Concepts
- Regular Languages and Finite State Machines
- Context-Free Languages and Pushdown Automata
- Recursively Enumerable Languages, Turing Machines, and Decidability