

CS 520
Fall 2011
Course Outline

Below are the topics we will cover, with approximate dates and some comments on readings. The course is divided into three sections. The end of each section contains some time for extra topics. These will be covered less completely than the main material.

9/6 Course overview, discrete math review.

Theory of Finite Automata.

9/13 Strings and languages; regular operations.

9/20 Deterministic and nondeterministic finite automata (as recognizers).

9/27 Equivalence of regular set models; non-regular sets.

10/4 Algorithms for finite automata: emptiness, minimization, etc.

10/11 Finite automata as computers, extra topics in finite automata.

Readings: Most of this material is in Chapter 1 of Sipser. Read Hopcroft and Ullman, Section 2.7 for minimization of finite automata, and Section 3.4 for finite automata as computers.

Computability Theory.

10/18 Turing machines and computable functions.

10/25 Turing machine variants; universal Turing machines.

11/1 Elements of recursive function theory; properties of recursive and r.e. sets.

11/8 Uncomputability: the halting problem, Rice's theorem.

11/15 Extra topics in computability theory.

Readings: An overview of computability theory can be found in Chapter 1 of Rogers. The material in this section can be found in Chapters 3-5 of Sipser, although his terminology is not standard (his "Turing-recognizable" is everyone else's "recursively enumerable.")

NP-Completeness.

11/22 Polynomial vs. exponential time.

11/29 The classes P and NP, nondeterministic algorithms.

12/6 NP-completeness; Cook's theorem.

12/13 Examples of NP-complete problems, extra topics in complexity theory.

Readings: This material is covered in Chapter 7 of Sipser. The standard book NP-completeness is Garey and Johnson, of which Chapters 2-3 are most useful to us.