CS 520
Introduction to Theoretical Computer Science
Fall 2017

Course description.

The goal of this course is to acquaint you with some formal models of computation. Roughly speaking, a "model of computation" is supposed to answer the following question: what problems can we expect to solve by means of an algorithm? As you might expect, the answer depends on which algorithms are allowed. Concepts from this course are used in every area of computer science.

We will cover the following three topics in some detail.

1. Regular sets and finite automata.
2. Turing machines and computability theory.
3. Complexity theory and an introduction to NP-completeness.

Intructor.

Eric Bach, 4391 CS, 262-7997. E-mail: `famous baroque composer at cs dot wisc dot edu` . Office hours MWF 11-12 (right after class), and by appointment.

TA.

Aravind Soundararajan, 1351 CS. E-mail: `soundararaj2@wisc.edu` . Office hours TR 11:30-12:30.

Time/place.

MWF 9:55-10:45, 105 Psychology.

Prerequisites.

Data structures (e.g. CS 367) and facility with discrete mathematics (sets and relations, proofs by induction, graphs, trees, etc.). Previous exposure to logic and programming languages is helpful but not necessary.

Text.

M. Sipser, *Introduction to the Theory of Computation*, 3rd Edition, 2012. (This differs only slightly from earlier editions.) We will cover Chapters 1,3,4,5,7 of this book.

Grading.

Homework problems will be handed out every few weeks. We will have an evening midterm exam around the end of October. The final will be 10:05 AM, Friday, December 15 (room TBA). Homework, midterm, and final each will count for a third of your numerical score.

Style.

I will try to put the complete course on the blackboard; it is recommended that you make a good set of lecture notes from this. Homework problems will vary in difficulty; although I would be delighted if you work all of them, you don't have to solve them all.

Related Courses.

The finite automata theory we will learn is put to use in the compiler design course CS 536. Computability theory plays a major role in mathematical logic. The beginning course in logic is Math 571. For a graduate-level introduction to complexity theory (which doesn't rely on much from 520), take CS 710.

Web Page.

Up-to-date copies of all assignments and other handouts can be sound on the course web page. You can find it at

`http://pages.cs.wisc.edu/~cs520-1` .

The web page also links to the Course Log, which is a lecture-by-lecture summary of topics covered.