CS38: THEORY OF COMPUTATION, Spring 2003

This course serves as an introduction to the central concepts of the theory of computation through basic concepts such as languages and regular expressions, on to abstract, limited (and increasingly powerful) models of computation such as deterministic and indeterministic finite automata, pushdown automata, context-free grammars, and then on to the limits of computation in Turing machines and unsolvability. We will also cover central topics in the theory of computational complexity. The power, beauty and elegance of the formal theory of computation has few peers in twentieth century science; hopefully, that will come across in this class.

Required textbook: Harry R. Lewis, Christos H. Papadimitriou. *Elements of the Theory of Computation*, 2nd edition, Prentice Hall, ISBN 0-13-262478-8. (I will try and provide references to other texts in case you would like to supplement your reading).

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Course Home page: `http://www.sci.brooklyn.cuny.edu/ schopra/cs38.html`
Class Mailing List: Send an email message to *majordomo@sci.brooklyn.cuny.edu* with a blank subject line and `subscribe cs38_sp03@sci.brooklyn.cuny.edu` as the body of the message. This is **mandatory**. Make sure you send this message from an email account that you plan to use regularly. I will assign homeworks on the class mailing list.

Requirements: There will be one midterm examination and one final examination. Each examination will cover *all* material previously covered. Some homeworks will also be required (these will account for 30% of the final grade). Feel free to work together on homework assignments, but write up your solutions separately.

Late Assignments: Late assignments will not be accepted. I am willing to evaluate them to give you feedback but do not expect a grade for them.

Examination Dates:
Midterm Examination (30 % of final grade): March 2nd.
The Final Examination (40 % of final grade) will be held during Finals week.

There will be NO MAKE-UP examinations.

Prerequisites: *V22.0310*. This class requires familiarity with concepts covered in a Discrete Structures course such as CS11. The textbook provides mathematical background needed in Chapter 1, Sections 1 through 6. Use these sections to refer to terms and expressions that seem unfamiliar in the material that we cover. Look through this material and make sure you know it well before lectures begin.

Lectures and Topics:

The following is a *tentative* sequence of lectures. We might deviate at times if some material takes a little longer to cover than expected or if we do a lighter treatment than that of the textbook. Check the course home page for links to other material that you might find interesting.

Languages: Sections 1.7, 1.8

Finite Automata: Sections 2.1-2.5

Context-free Languages: Sections 3.1-3.5

Turing Machines: Sections 4.1-4.6

Undecidability: Sections 5.1-5.6

Computational Complexity: Chapter 6

We will try and look at Chapter 7 if time permits.