<div align="center">Course Overview</div>

CS 334: Theory of Computation                                    Fall 2015
Instructor: Ashwin Lall                                 Last modified: 2015-09-07

## Course Details

- Meeting place and times: Olin 220, MWF 9:30-10:20, R 9-10
- Instructor: Dr. Ashwin Lall
- Office Hours: 10:30-12:30 M, 10:20-11:20 W, 10-11 R, or by appointment
- Textbook: *Introduction to Automata Theory, Languages, and Computation*, by Hopcroft, Motwani, and Ullman. **Third Edition**.
- Course webpage: http://personal.denison.edu/~lalla/cs-334

## Course Description

In this course we will study computers as mathematical abstractions with the goal of understanding the limits of computation. We will engage in a mathematical, proof-based study of finite automata, context-free grammars, and Turing machines to learn what each is (not) capable of. In the final part of the course we will focus on intractability, to characterize the problems that computers are incapable of solving with realistic amounts of processing power and memory.

## Course Objectives

By the end of this course you should be able to

- construct finite automata and be comfortable with regular expressions and languages;
- convert regular expressions into finite automata and vice versa;
- convert non-deterministic finite automata into deterministic ones;
- prove when a language is not regular;
- comfortably work with context free grammars and pushdown automata;
- prove when a language is not a context-free language;
- design Turing machines;
- prove rigorously which problems computers cannot solve;
- define the complexity classes P and NP; and
- prove a problem to be NP-complete.

## Grading

Grades will be based on the following weighting scheme:

| Homework | 30% |
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| Midterms | 30% |
| Quizzes | 20% |
| Final Exam | 20% |

**Homework:** There will be homework assigned every week. Homework is due back by the beginning of class exactly one week after it is assigned. I will not accept late homework—solutions will be posted right after the assignment is due. To account for sickness, personal emergencies, etc., I will drop the lowest grade on your homework when computing your aggregate grade for the semester. You may, and are encouraged to, discuss the homework with other members of the class; however you **must** write up your own homework. In other words, you may discuss homework problems and even proof strategies with your classmates, but you must be on your own when you write up the final solutions. Finally, all homework must be typed up in LATEX, though diagrams can be drawn by hand.

In addition to the weekly homework, you will be expected to write a short paper on an advanced topic of your choosing from within the theory of computation. More details on this will be made available by mid-semester.

**Quizzes:** You will have short quizzes at the beginning of most class periods. Please review material covered in the previous class and be up-to-date with reading to do well in these. To account for unforseen circumstances, I will discount the two lowest quiz grades for the semester when computing your aggregate grade.

**Midterms and final:** The midterms and final individually make up a significant fraction of your grade for the semester. There will be **no** makeup exams, so do not miss a single one! The dates will be posted on the course website.

**Cheat sheet:** For all in-class tests (i.e., quizzes, midterms, and also the final) you are allowed a single-sided sheet of $8\frac{1}{2}$" $\times$ 11" paper to fill with any *handwritten* definitions, notes, formulas, worked out examples, etc. that you can fit on it. You must make this sheet yourself by hand and it must be your own (i.e., not borrowed from someone else).

## Academic Honesty

Academic honesty, the cornerstone of teaching and learning, lays the foundation for lifelong integrity. Academic dishonesty is intellectual theft. It includes, but is not limited to, providing or receiving assistance in a manner not authorized by the instructor in the creation of work to be submitted for evaluation. This standard applies to all work ranging from homework assignments to major exams.

I will assume that you are familiar with the Code of Academic Integrity. To learn more about it, please go to http://www.denison.edu/about/integrity.html.

As discussed above, you may talk with your classmates about the homework. However, at the end of any such discussion you should leave with nothing written down, typed up, etc. You may not consult any other person (other than the instructor), or consult other resources such as webpages or books other than our text book to complete your homework problems.

## Disability Accommodation

Any student who thinks he or she may need an accommodation based on the impact of a disability should contact me privately as soon as possible to discuss his or her specific needs. I rely on the Academic Support and Enrichment Center in Doane to verify the need for reasonable accommodations based on documentation on file in that office.