Syllabus for COMP314, Theoretical Foundations of Computer Science

Spring 2016
Dickinson College
Instructor: John MacCormick

Goals

- understand what types of computations can be performed in theory and in practice
- understand abstract computational models (such as Turing machines and finite automata), elementary notions of universality and undecidability, and their significance for practical computing
- understand elementary notions of complexity theory, including complexity classes P, EXP, NP, and the rudimentary theory of NP-completeness
- increase mathematical maturity by making rigorous mathematical arguments about computations

Teaching methods

- Required reading in advance of most lectures
- Lectures and class discussions
- Homework and exams to reinforce understanding of concepts

When and where

- Classes: Monday and Thursday 1:30–2:45pm, Tome 118
- Office hours: see the instructor's webpage

Books

The primary resource for this course is an unpublished draft of a textbook currently being written by the instructor: *What Can Be Computed? A Practical Guide to the Theory of Computation*, by John MacCormick. Electronic copies of the manuscript will be made available on Moodle, and printed versions of Part I of the manuscript will be available for purchase in the first week of classes.

In addition, the following books provide useful content for those who are interested in additional background:
- Linz, An Introduction to Formal Languages and Automata
- Moore and Mertens, The Nature of Computation
- Sipser, Introduction to the Theory of Computation
- Lewis and Papadimitriou, Elements of the Theory of Computation
- Fortnow, The Golden Ticket: P, NP, and the Search for the Impossible

Please consult with the instructor for guidance on which parts of the above books would best suit your background reading goals.

Assessment and grading

- Final grade will comprise:

Homework assignments (about 10 x 2% each)	20%
Midterm exams (2 x 20% each)	40%
Final exam	40%

- **Homework assignments:** There will be approximately 10 homework assignments, due at the start of class on the dates specified on the class schedule. Unless otherwise stated, homework assignments must be submitted in hard copy. ***Questions must be numbered very clearly, so that the instructor can quickly and easily find any given question. Assignments without clear question numbers will be rejected.*** Neatly handwritten solutions are acceptable. The weighting of homework assignments is not equal; the weight of a homework assignment will be proportional to the total number of points of the questions graded on that assignment. Only a random subset of homework questions will be graded. Some will be graded on correctness and some on completeness only. In all cases, it is the responsibility of the student to consult the provided solutions and understand the correct approach to every question, whether or not it was graded. As explained on the course webpages, you can recover 50% of the points lost on any assignment by resubmitting a corrected version.
- **Midterm exams:** There will be two 75-minute midterm exams, in class on 3/10 and 4/25.
- **Final exam:** The final exam will take place 2pm-5pm on Tuesday, May 10.
- The midterm and final exams are open note. Students may consult any printed or handwritten materials brought into the exam and any static content stored locally on the student's own device or on a Dickinson College server. Web searches are not permitted. No content stored outside the College network may be consulted. Electronic devices may only be used for browsing static content. Devices may not be used to perform any other type of computation.
- Final scores will be converted to grades according to the following thresholds (or possibly more generous thresholds): 93%=A; 90%=A-; 87%=B+; 83%=B; ... ; 60%=D-.

What will be on the exam?

Technically speaking, any material covered in any lecture, reading or homework assignment is eligible to appear in the midterm or final exams. In practice, a strong majority of exam questions will be similar to a homework question, an example done in class, or other assigned practice questions.

Amount of work

College policy recommends approximately 3 hours of independent work for every hour of class time. Our class meets for 2.5 hours per week. Therefore, you should expect to spend 7-9 hours per week (outside of class time) on this course.

Plagiarism, copying, and collaborating

The College's standard policy on plagiarism applies and you should be familiar with it, but here are some key points that apply particularly to this course:
- All work must be your own.
- Never copy work from someone else or allow your own work to be copied.
- You may not copy or consult assignment solutions from any source, including online repositories or solutions provided for previous instances of the course. Exception: you may consult solutions provided for this instance of the course, after they have been posted to Moodle.
- If you use exact words taken from any source, you must use quotation marks and cite the source.
- Students are encouraged to help each other understand concepts, including concepts that apply to homework and programming assignments. However, all work must still be your own. So if you discuss a problem with someone, you must destroy any written or electronic material that results from the discussion, and re-create it later on your own.
- Be especially careful not to copy computer code from another student, or from the Internet (unless an assignment question specifically states that it is permitted – and even then, state the origin of any copied code clearly using a comment in your source code). Sharing or copying computer code is easy and often tempting, but it is not permitted and will suffer the same penalties as any other form of cheating.

Accommodations

The instructor will follow college policy on accommodations for students who need them.

Late Work Policy

Each student is permitted a total of four no-penalty days of lateness for submitted work over the entire semester; every subsequent day of lateness incurs up to a 25% penalty for the late assignment. Late days can be used only in whole day units. Accounting for late days is mostly via an honor system: students should keep count of their late day usage.   To use one or more late days on a given assignment, state clearly at the start of your submission how many days you are using and the total used so far in the semester.