CS/MATH 387: COMPUTABILITY AND COMPLEXITY COURSE INFORMATION

SPRING 2023

Location:	Physics 240A, MWF 9:00–9:50 am
Instructor:	David Perkinson (he/his) (davidp@reed.edu)
Course homepage:	https://people.reed.edu/~davidp/361/
Moodle:	https://moodle.reed.edu/course/view.php?id=4829
Text:	Introduction to the Theory of Computation, 3rd edition, by Michael Sipser
Office hours:	10–11 MWF, 3–4 TuTh, by appointment, or by drop-in

Course description. This is an introductory course in models of computation and complexity in computer science. It is a cross-listed course in Computer Science and in Mathematics.

Learning outcomes. After taking this course, you will understand the basic models of computation including finite automata, formal languages, and Turing machines, culminating in universality and undecidability. You will also understand the basic resource-bounded models of computation and algorithmic complexity classes, including NP and PSPACE, and the notions of relative hardness and completeness.

Distribution requirements. This course can be used towards your Group III, "Natural, Mathematical, and Psychological Science," requirement. It accomplishes the following goals for the group:

- » Use and evaluate quantitative data or modeling, or use logical/mathematical reasoning to evaluate, test, or prove statements.
- » Given a problem or question, formulate a hypothesis or conjecture, and design an experiment, collect data or use mathematical reasoning to test or validate it.

This course **does not** satisfy the "primary data collection and analysis" requirement.

Class structure. This will be a flipped class based on MIT Opencourseware materials. Before coming to class, you will be expected to have completed a reading assignment and to have watched an associated video lecture. Most of class will be spent working in small groups on problems related to the day's material.

Since the course relies on group work, your attendance is essential. When your health allows, you are expected to be present and engaged. At the same time, each community member has an individual responsibility to help prevent the spread of the coronavirus and other diseases. If you need to miss a class, or series of classes, due to illness, self-isolation, and/or quarantine, you are responsible for emailing me to let me know as soon as possible.

Text. Our text will be *Introduction to the Theory of Computation*, by Michael Sipser, third edition. (Earlier editions should be fine, too.)

Homework. Homework assignments will be posted on our course homepage and will be due each Wednesday via Gradescope.¹ Excellent solutions take many forms, but they all have the following characteristics:

- » they use complete sentences, even when formulas or symbols are involved;
- » they are written as explanations for other students in the course; in particular, they fully explain all of their reasoning and do not assume that the reader will fill in details;
- » when graphical reasoning is called for, they include large, carefully drawn and labeled diagrams;
- » they are neatly typeset using the LATEX document preparation system. A guide to LATEX resources is available on the course homepage.

I reserve the right to not accept late homework. If health or family matters might impede the timely completion of your homework, please contact me as early as possible.

Feedback. You will receive timely feedback on your homework via Gradescope. Most homework problems will be graded on a five-point scale (5 = perfect; 4 = minor mistake; 3 = major mistake, right idea; 2 = significant idea; 1 = attempted, 0 = none of the above). *The quality of your writing will be taken into account.* If your answer is incorrect, this will be reflected in the score, and there will also be a comment indicating where things went wrong with your solution. You are strongly encouraged to engage with this comment, understand your error, and try to come up with a correct solution.

Collaboration. You are permitted and encouraged to work with your peers on homework problems. It is best practice to cite those with whom you worked, and you must write up solutions independently. **Duplicated solutions will not be accepted and constitute a violation of the Honor Principle.**

Exams. We will have a midterm exam and a final exam. Both are likely to be in-class.

Grades. Your grade will be based on the quality of participation in group work, your homework, and your exams.

Added during 4th week of class. As stated earlier, since we are doing daily group work, attendance is essential, and the quality of your participation will be a factor in your grade. A factor in participation is actual attendance. If you miss more than six classes, for whatever reason, your overall

¹Gradescope is an online homework submission and evaluation platform. You are likely to already be enrolled in our Gradescope class. If not, you will be able to enroll using a link+code provided on our Moodle page.

grade will be lowered one step. For example, a grade that would otherwise be an A- would become a B+, and a B+ would become a B, and so one. After that, each additional two absences will lower the grade another step.

Academic honesty: As noted above, for homework you should write your own solutions and disclose your collaborators. Searching for solutions to homework or exam problems on the internet or copying solutions from fellows students is an Honor Principle violation and will result in an academic misconduct report.

Help. There are a number of resources you can access for help with this course's content. Everyone is welcome and encouraged to attend my **office hours**. They are an opportunity to clarify difficult material and also delve deeper into topics that interest you. Further, every Reed student is entitled to one hour of free **individual tutoring** per week. Use the tutoring app in IRIS to arrange to work with a student tutor.

Technology: Do not browse the internet, answer your email, or engage with text messages during class. It is rude and disrupts learning.

Academic accommodations. If you have a documented disability requiring academic accommodation, please have Disability & Accessibility Resources (DAR) provide a letter during the first week of classes. We can then discuss your accommodations. I cannot provide accommodations after an assignment has been turned in or within 24 hours of an exam. If you believe you have an undocumented disability and that accommodations would ensure equal access to your Reed education, I would be happy to help you contact DAR.