Course Information
CS/Math 385
Theory of Computation
Fall 2019

Finding me:

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Office hours: Mondays 2-3, Tuesdays 12-2, Wednesdays 2-3, and by appointment. Please DO interrupt at least to let me know you're there and waiting for me. Feel free to call or drop by to see if I'm available.

Learning Outcomes:

(1) Students will improve their ability to follow and construct precise arguments about computer programs, especially those involving proof by induction and contradiction, at various levels of formality.
(2) Students will improve their ability to construct, understand, and make precise arguments about formal mathematical objects relating to computational ideas and models of computation.
(3) Students will learn to work with finite automata, pushdown automata, and Turing machines, as well as the associated classes of grammars and languages. This includes:
   - Tracing the operation of specified automata on specific inputs.
   - Designing automata that accept particular languages.
   - Describing the languages accepted by particular automata.
   - Giving mathematical arguments matching grammars, languages, and automata.
   - Modifying descriptions of automata or languages to give equivalent automata or languages, or other automata or languages related to the originals in a prescribed manner.
(4) Students will understand the possibilities and limits of machines under various models of computation. This includes:
   - Showing that languages generated by various operations to combine languages are computable.
   - Using pumping lemmas to show that certain languages are not computable using certain models.
   - Using reductions to show that certain languages are not computable.
(5) Students will communicate clearly, effectively, and in an organized fashion their solutions to problems, their reasoning, their understanding of concepts, and their understanding of procedures and their justification.

These learning outcomes will be assessed using homework and exams.

Textbook: Peter Linz, *An introduction to Formal Languages and Automata*, 6th edition, ISBN 978-1-284-07724-7. There is a CD with the book. I will not explicitly use it, and the software on it is available at www.jflap.org

Class Fromat: We are scheduled to meet Mondays, Wednesdays, and Fridays at 11:30am in Engineering/Physics 202 and 204. I will mostly lecture, but there may occasionally be short problems for you to work on and discuss with your neighbors during many classes.

Attendance: You are expected to come to every class. Some classes may have group work; you are expected to participate.

Grading: The course will be based on 700 points as follows:

Homework	150
Two midterm exams	150 each
Final exam	250

Precise translation of points to grades will be announced after each exam and will depend on the difficulty of the exams and the homework assigned so far. You should expect to need about 600 points for an A, 500 for a B, and 400 for a C, but actual numbers may be higher or lower.

Homework: One short problem will be assigned at the end of many classes, particularly near the beginning of the semester. These problems will be due at the beginning of the following class. A more substantial assignment will be made each Wednesday evening (occasionally Thursday morning) by e-mail. This will be due the following Wednesday. Homework is due at the beginning of class, but everyone who attends class and pays attention has an automatic extension until 4:30pm. While the daily assignments will be graded completely, you should expect that only a sample of the weekly problems will be graded.

Exams: Midterms will be on September 27 and November 1, during class. (There may be different arrangements, to be announced for students in Coeur d'Alene.)

The final exam will be on Wednesday, December 18, 10:15am—12:15pm.

If you have a conflict preventing you from taking an exam at the scheduled time, you must let me know at least one week in advance. Make-up (or early) exams will only be given for documented, important conflicts in accordance with the one week policy or for genuine documented emergencies. Except in the case of a documented emergency, missing the final exam without prior arrangement will result in a grade of F for the course.

Disability Accomodations: Students with disabilities needing accomodations to fully participate in this class should contact Center for Disability Access and Resources (CDAR). All accomodations must be approved through CDAR prior to being implemented. To learn more about the accomodation process, visit CDAR's visit at <www.uidaho.edu/cdar>, call 208-885-6307, e-mail <cdar@uidaho.edu>, or visit Pitman Center Suite 127.

Plagiarism and Cheating: Work on exams should be entirely your own, with no help of any kind from any other source. (You may of course ask questions of the instructor or other proctor, but there is no guarantee you will get an answer.)

You are encouraged to discuss the homework problems with other students. You may also look up additional sources, for example the hints in the back of the book, on the homework. However, you must write your homework solutions independently. This means you should take at most brief notes of hints from discussions or from a found source and then write a solution from those hints. Excessive similarity in style and phrasing between the homework turned in by two students or between homework answers and a found source will be considered suspicious. I am well aware that solutions to homework problems can be found on the Internet.

Tentative Schedule:

Date	Topics	Reading
Aug 26	Introduction	1.1, 1.2
28	Deterministic Finite Automata	2.1
30	Formalization of DFAs	2.1
Sep 4	Nondeterministic Finite Automata	2.2
6	Equivalence of DFAs and NFAs	2.3
9	More on equivalence	2.3
11	Regular expressions	3.1
13	Regular expressions and FAs	3.2
16	Regular expressions and FAs	3.2
18	Regular grammars	3.3
20	The class of regular languages	4.1
23	Algorithms for regular languages	4.2
25	Review	
27	Exam 1	
30	Proving languages are non-regular	4.3
Oct 2	The FA pumping lemma	4.3
4	Context-free grammars	5.1
7	Formalism for grammars	5.1
9	Parsing and ambiguity	5.2 (5.3)
11	Simplifying grammars	6.1
14	Chomsky Normal Form	6.2
16	Pushdown Automata	7.1
18	Formalization of PDAs	7.1
21	PDAs and CFGs	7.2
23	PDAs and CFGs	7.2
25	Deterministic PDAs	7.3
28	The class of context-free languages	8.2
30	Review	
Nov 1	Exam 2	
4	Non-context-free languages	8.1
6	CF pumping lemma	8.1, 8.2
8	Turing machines	9.1
11	Turing machine formalizations	9.1
13	Programming Turing machines	9.2
15	Variant Turing machines	10.1
18	Variant Turing machines	10.2
20	Nondeterministic Turing machines	10.3
22	Pattern avoidance and generating functions	
Dec 2	Universal Turing machines	10.4
4	Recursive languages	11.1
6	Recursive enumerability	11.1
9	Unrestricted grammars	11.2
11	Undecidable problems	12.1
13	Review	