Theory of Computation, Spring 2021 Syllabus

Course Logistics

Staff	Email	Office Hours
Aaron Cote	aaroncot@usc.edu	Mon 11:30am-1:30pm, Wed 12:30-1:30pm, Fri 11:30am-2:30pm

Lecture: MW 2-3:50pm, https://usc.zoom.us/j/9589028572
Websites: https://blackboard.usc.edu, https://piazza.com
Textbook (required): Introduction to the Theory of Computation, by Michael Sipser
Textbook (required): The Universal Computer, by Martin Davis

Grading

Artifact	Weight	Date
Problem Sets	35%	Various
Project	15%	Wednesday, April 28th
Midterm	25%	Monday, March 15th
Take-home Final	25%	Thursday, May 2nd

Project

You will choose an interesting topic in the course. A relevant and important research paper (or papers) will be obtained and read. You will then write a 4-5 page paper summarizing the results and their importance. You may work in pairs for this project, but your paper should be 8-10 pages if you do so.

A list of suggested paper topics will be given at the mid-point of the semester.

Collaboration Policy

You are free to work together on the homework. Just make sure to clearly indicate your collaborators at the top of your submission, and make sure you understand each of your answers.

Exams

The midterm will be conducted through blackboard, and will be individual effort, open-book and open-notes.

The final will be a take-home exam. It will be individual effort, open-book and open-notes.

Late Policy

You will submit homework through Blackboard by the deadline 1:30pm. You are allowed three late days over the course of the semester, and you can use one per homework, allowing you to submit up to 24 hours late. Homework will not be accepted beyond the allowed grace period.

Grading Scale

The following cutoffs indicate the **minimum** grade you will receive. The instructor reserves the right to lower some or all of the cutoffs at the end of the semester.

Letter	% for grade +	% for grade	% for grade -
A	95	85	80
B	75	70	65

Tentative Schedule

Week	Day	Topic	Sipser	Davis	HW
1	1/20	Introduction	Ch. 0, 1.1		
2	1/25	Nondeterminism, Regular Expressions	Ch. 1.2, 1.3	Ch. 1	
	1/27	Nonregular Languages	Ch. 1.4	Ch. 2	HW 1 Out
3	2/1	Context-Free Languages	Ch. 2.1	Ch. 3	
	2/3	Pushdown Automata	Ch. 2.2		HW 1 In
4	2/8	Non-context-free Languages	Ch. 2.3, 3.1	Ch. 4	HW 2 Out
	2/10	Turing Machines	Ch. 3.2	Ch. 5	
5	2/17	Turing Machines Variants	Ch. 3.3, 4.1		HW 2 In
6	2/22	The Halting Problem	Ch. 4.2	Ch. 6	HW 3 Out
	2/24	Undecidable Problems		Ch. 7	
7	3/1	Reducibility	Ch. 5.1		HW 3 In
	3/3	The Post Correspondence Problem	Ch. 5.2, 5.3	Ch. 8	HW 4 Out
8	3/8	P and NP	Ch. 7.1-7.3	Ch. 9	
	3/10	The Cook-Levin Theorem	Ch. 7.4, 7.5		HW 4 In
9	3/15	**Midterm**			
	3/17	Space Complexity	Ch. 8.1, 8.2		
10	3/22	PSPACE	Ch. 8.3		Project Proposal In
	3/24	PSPACE-Complete			HW 5 Out
11	3/29	Logarithmic Space	Ch. 8.4-8.6		
	3/31	L and NL			HW 5 In
12	4/5	NL-Complete			HW 6 Out
13	4/12	Hierarchy Theorems	Ch. 9.1		
	4/14	Relativization	Ch. 9.2		HW 6 In
14	4/19	Why is P vs. NP hard?			HW 7 Out
	4/21	Quantum Computing			
15	4/26	Quantum Computing			HW 7 In
	4/28	Quantum Computing			Project In