CSCI 26500 – Computer Theory 1

Instructor: Justin Tojeira

MW 5:30-6:45pm | West Bldg W714 | Spring 2026

Text: *Introduction to Automata Theory, Languages, and Computation*, 3rd Edition. Hopcroft, Motwani, Ullman. 2006. ISBN-10: 0321455363 ISBN-13: 978-0321455369

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Course Description:

In this course, you will develop your abstract mathematical reasoning ability while learning about logic, set theory, automata theory and formal languages, and computability theory. We will learn formal definitions and algorithms for each topic, as well as a variety of proof techniques that can be applied across numerous fields in mathematics, computer science, and logic.

Learning Outcomes:

- Develop abstract mathematical reasoning skills, including but not limited to abstraction, generalization, pattern recognition, logical reasoning including inductive and constructive reasoning, problem solving, and finding counterexamples and edge cases.
- Understand formal languages, automata theory, complexity theory, and computability theory.
- Apply concepts, properties, and proof techniques from set theory to languages and classes of languages.
- Design and analyze automata, expressions, and grammars for each class of languages.
- Rigorously prove mathematical properties, and especially properties of sets, using a variety of techniques and without reliance on a formal proof system.
- Be able to read, understand, and explain nontrivial mathematical proofs.
- Understand abstract mathematical concepts including deterministic and nondeterministic computation, infinite sets, and mathematical paradoxes.

Grading:

Exams: 75% – 3 exams at 25% each out of 4 exams given
Homework: 25% – graded on completion and thoroughness

Exams:

There will be 4 exams, spaced evenly, so about every 7th class. 3 of these exams will be counted towards your grade, each counting for 25%.

Exact dates will be announced prior to each exam in class and on Blackboard. The 4th exam will technically be the final, but the exams are not strictly cumulative. All exams will be 70 minutes.

You may drop your lowest midterm grade (or a missed midterm), but you must attend the classes and do the homework associated with the dropped exam. Dropping an exam does not mean missing one-quarter of the semester.

For those who pass all the midterms and are satisfied with their exam average, it may be possible to skip or drop the final instead of dropping a midterm. Requirements for this will be discussed near the end of the semester.

Homework:

Homework will be given on a regular basis and will be reviewed in class. Homework must be submitted on Gradescope and will be due 15 minutes before class starts. There will be about 12 assignments, each graded as "complete or mostly complete" for 2 points, "partially complete" for 1 point, and "incomplete" for 0 points. Up to 4 points of homework may be made up via late submissions, which are typically one week after the usual due date. You will start with 25 points, and any missed points will be subtracted from that.

Blackboard (http://bb.hunter.cuny.edu/) will be used to post announcements, exam dates, and homework. There will be some material posted on Blackboard that is not covered in the textbook. You should check Blackboard on a regular basis.

Approximate class schedule, with one class of slack time and exam 4 during finals week:

Class	Topic	Class	Topic
1	Formal languages, regular languages, review of set theory and first-order logic	15	Context-Free Languages and Grammars
2	DFAs, string searching, regular expressions	16	Parse Trees, Derivations
3	More examples of DFAs and regexes	17	Generating Expressions, Ambiguity
4	Infinite sets, proofs; formal definitions	18	Pushdown Automata, CFGs to PDAs
5	DFA minimization; determinism and NFAs	19	CNF; Closure Properties of CFLs
6	Thompson's Construction; Review	20	Review
7	**Exam 1**	21	**Exam 3**
8	Kleene's theorem, subset construction	22	CSLs, Recursive and RE Langs/Grammars
9	State elimination algorithm	23	Turing Machines; Chomsky Hierarchy
10	Closure properties and proofs	24	Diagonalization, Infinity, Unsolvability
11	Pumping Lemma for Regular Languages	25	P/NP, Reductions; Simulations
12	Myhill-Nerode Theorem	26	L_u, Halting problem
13	Review	27	Review
14	**Exam 2**	28	-

Syllabus Compliance

This syllabus is a guide for the course and is subject to change if the need arises. Any adjustment to the material, schedule, or grading policy will be posted on Brightspace.

Additional Contact Information

Computer Science Department main office: North 1008 (10^{th} floor North Building), 212-772-5213

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a. Sexual Violence: Students are strongly encouraged to immediately report the incident by calling 911, contacting NYPD Special Victims Division Hotline (646-610-7272) or their local police precinct, or contacting the College's Public Safety Office (212-772-4444).
b. All Other Forms of Sexual Misconduct: Students are also encouraged to contact the College's Title IX Campus Coordinator, Dean John Rose (jtrose@hunter.cuny.edu or 212-650-3262) or Colleen Barry (colleen.barry@hunter.cuny.edu or 212-772-4534) and seek complimentary services through the Counseling and Wellness Services Office, Hunter East 1123.
CUNY Policy on Sexual Misconduct Link: https://www1.cuny.edu/sites/title-ix/campus/university/

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