

CS 4510 Syllabus

Automata and Complexity, Section B, 3 Credits

Fall 2026

Instructor Information

Instructor: Joseph Jaeger

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General Course Information

Description

This course serves as an exploration of the fascinating world of theoretical computer science. We will discuss various models of computing and classify problems by the strength of the model needed to solve. This provides insight into the fundamental question of what computation is and what problems are hard or easy to solve.

Course Learning Outcomes

By the end of the course, you should be able to:

- Design and manipulate deterministic and nondeterministic finite automata and regular expressions, convert between them, and use them to prove that a language is regular
- Design and manipulate pushdown automata and context-free grammars, convert between them, and use them to prove that a language is context-free
- Use the appropriate pumping lemma to prove that a language is not regular/context-free
- Design Turing machines and use them to prove that a language is decidable
- Use reductions from undecidable problems to show that a language is undecidable
- Use reductions from NP-complete problems to show that a problem is NP-complete
- Analyze the time and space complexity of a decision problem

Required Course Materials

“Introduction to the Theory of Computation” by Michael Sipser (3rd edition)

The textbook is available from the Georgia Tech Barnes and Noble Bookstore, [link](#)

Grading Policy:

Your final grade will be assigned as a letter grade according to the following scale:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	0-59%

Homework counts as 40% of the final grade, with the lower homework grade replaced by the highest homework grade.

Exams count as 60% of the final grade, with the lowest scoring exam counting for 15%, the highest scoring exam counting for 20%, and the remaining exam counting for 20%.

Assignments

- Homework (Weekly), 40%
- Exams (Two Midterms, One Final), 60% (15%, 20%, 25%)

Description of Graded Components

Homework assignments will typically be weekly. We expect ~10 homework assignments and will replace your lowest homework grade with your highest homework grade.

For homework assignments submitted on time, there is a ~3% extra credit bonus! However, sometimes life gets in the way, and that's okay. You may submit your homework one day late for no penalty, or two days late with a ~10% penalty. Submissions more than two days after the deadline will NOT be graded.

There will be three exams, two midterms and one final. Your lowest scoring exam will count for 15% of your final grade, your highest scoring exam will count for 25% of your final grade, and your remaining exam will count for 20%.

Course Policies

Collaboration, Group Work, and Use of Generative AI

You may collaborate with your classmates on homework assignments, but all written work should be your own and you should understand everything you write. To ensure you comply with this, follow the “Gilligan’s Island Rule” — wait 30 minutes after your collaborating

before writing your own solutions from scratch (enough time to watch an episode of Gilligan's Island).

While completing homework assignments you may use as a resource any textbooks, lecture notes, or videos from similar courses. The course textbook is well written and is fantastic resource. No other resources may be used, including homework solutions from this or other courses, generative AI systems, or web forums.

Re-Scheduled/Missed Exams

Make-up exams are given for illness, approved Institute activities or religious observances.

Attendance and/or Participation

Lecture attendance is highly encouraged but is not tracked and will not directly affect your grade.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review [Georgia Tech's Honor Code](#) and the student [Code of Conduct](#).

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, [contact the Office of Disability Services](#) (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. [The Student-Faculty Expectations](#) articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Pre-Requisites

The formal prerequisites of this course include a course each in algorithms, combinatorics, and probability/statistics. These may be waived with instructor approval. The minimum baseline is CS 2050 Intro to Discrete Math or similar. This is a math course. We expect you to be comfortable with mathematical notation, reading proofs and writing proofs.

Campus Resources for Students

Undergraduate Student Academic Success Resources:

A list of resources for undergraduate students' academic success and information about advising can be found at [Success at Tech](#).

- Academic Support: Academic Success and Advising (a unit in the Office of Undergraduate Education & Student Success) provides free support for your courses. Students can attend scheduled supplemental review (PLUS) sessions, stop by Drop-In Tutoring, or schedule a one-on-one appointment through Knack. To explore what options work best for you, please visit us online at success.gatech.edu/tutoring, email us at tutoring@gatech.edu, or come see us at Clough Undergraduate Learning Commons, Suite 283.

Student Well-Being:

At Georgia Tech, we are concerned about your overall physical, social, and mental well-being. A [comprehensive list](#) of wellness related resources has been compiled and maintained by the Office of the Vice President for Student Engagement and Well-being ([student-resource-guide \(gatech.edu\)](#))