CSCI 361: Theory of Computation (Fall 2025)

Instructor:	Shikha Singh	**Email:**	ss32@williams.edu
Time:	9:55-11:10 am	**Room:**	Schow 30A

Course Overview and Resources: This course introduces a formal framework for investigating both the computability and complexity of problems. We study several models of computation including finite automata, regular languages, context-free languages, and Turing machines. These models provide a mathematical basis for the study of computability theory. The class also explores important topics in complexity theory: hardness of problems and reductions and characterizations of time and space complexity classes. Prerequisites: CSCI 256 or MATH 3xx and Permission of Instructor.

- Course webpage: https://williams-cs.github.io/cs361-f25/
- GLOW page: https://glow.williams.edu/courses/7526217
- Textbook: Introduction to the Theory of Computation by Michael Sipser (3rd ed)

Grading Policy: The final grade will be calculated based on the following breakdown:

- Daily Exercises (10%)
- Problem Sets (15%)
- Survey Paper and Presentation (10%)
- Midterm and Final Exam (30% + 35%): The exams will be reweighted based on performance—the lowest score will be worth 5% less, and the highest worth 5% more.

Attendance and Class Participation: Learning is a collaborative endeavor and most lectures will include in-class group activities and exercises to practice the concepts in the reading and lecture. The final grade may be adjusted by up to ±5% to reflect the quality of class participation and engagement.

Attendance is required and essential to the course. For an excused absence, students must inform me of their absence before the start time of the missed lecture; otherwise the absence will be considered unexcused. If a student has more than 4 unexcused absences, they will be sent a formal warning. Any further absences after the formal warning will result in a letter grade penalty.

Readings and Daily Exercises: Keeping up with the readings is an important part of coming to class prepared. Daily exercises will be assigned based on the reading for each lecture. These will be due at the beginning of each class and must be submitted on paper; no LaTeX required.

The daily exercises are meant to reinforce definitions from the text and must be done individually—that is, no collaboration or help from TAs is permitted for these questions. The rubric for grading these will be coarse: a check for full credit, check minus for several errors or missing answers and no credit for not submitting or leaving it mostly blank.

Assignments: There will be weekly problem sets to practice concepts from class and prepare students for the exams. Students are required to typeset their solutions in LaTeXusing the template provided. All assignments must be submitted through https://www.gradescope.com/ (course code: 7XZ2KZ).

Late Policy: Students are expected to turn in all assignments by the due date to receive full credit. Please contact me as soon as possible if you cannot meet a deadline. Extensions may be provided in case of exceptional circumstances. Unexcused late problems sets will incur a penalty of 10% per late day.

Late daily exercises will not be accepted. However, the lowest two daily exercise grades will be dropped.

Exams: The course has two exams: a midterm which be held in class midway and a scheduled final exam during the final exam period.

Survey Paper and Presentation: At the end of the course, the students must write a short survey paper on an advanced topic and present their findings through a brief presentation in class. Students are expected

to work in pairs. Example topics and further guidelines will be provided in class.

Course Schedule: A tentative schedule of topics is provided below and is subject to change.

Week	Topic
Week 1	Welcome & Course Overview
Week 2	Finite Automata
Week 3	Regular Languages
Week 4	Non-regularity
Week 5	Context-Free Languages
Week 6	Turing Machines
Week 7	Decidability and Church-Turing Thesis
Week 8	Reductions
Week 9	Time Complexity, P vs NP
Week 10	NP Completeness
Week 11	Space Complexity
Week 12	Wrap Up and Student Presentations

Academic Honesty: For a full description of the Computer Science Honor Code, please see: https://csci.williams.edu/the-cs-honor-code-and-computer-usage-policy/. If you have any doubt about what is appropriate, please email me at ss32@williams.edu. Specific rules are outlined below.

- Problem sets and daily exercises are meant to provide practice with the concepts covered in class. You must not seek help on these by searching the internet or AI tools by using problem-specific prompts or searching for similar problems.
- Students must only use definitions and concepts that have been covered in class. Any solution that uses concepts not covered in class will not receive credit.
- Collaboration is encouraged for assignment questions unless stated otherwise explicitly. Students can exchange broad ideas or general approaches toward problem sets with other students, but may not engage in any joint writing or step-by-step problem solving. Refrain from crafting your response to the problems in the presence of others and do so independently.
- You must always **cite external resources** used for background reading.
- You should never turn in a solution that you do not understand. If an honor-code violation is suspected, you will be asked to explain your solution orally to determine if you came up with it on your own.

Health and Accessibility Resources: Students with disabilities or disabling conditions who experience barriers in this course are encouraged to contact me to discuss options for access and full course participation. The Office of Accessible Education is also available to facilitate the removal of barriers and to ensure access and reasonable accommodations. Students with documented disabilities or disabling conditions of any kind who may need accommodations for this course or who have questions about appropriate resources are encouraged to contact the Office of Accessible Education at oaestaff@williams.edu.

Inclusion and Classroom Culture: The Williams community embraces diversity of age, background, beliefs, ethnicity, gender, gender identity, gender expression, national origin, religious affiliation, sexual orientation, and other visible and non-visible categories. I welcome all students in this course and expect that all students contribute to a respectful, welcoming and inclusive environment. If you have any concerns about classroom climate, please come to me to share your concern.

A note on preferred names/pronouns: In this class, we use the name and gender pronouns that individuals ask us to use as a sign of mutual respect. Please ensure that your preferred pronouns are up to date on GLOW. That said, everyone makes mistakes—in general, should you use an incorrect pronoun or name, the best course of action is to make a quick correction and move on, rather than dwelling on it.