CS 327 Theory of Computation

Summer 2023

Course Credits: 4
Contact Hours: 55 hours
Instructor: TBA
Email: TBA

COURSE OBJECTIVES

This course is designed to introduce students to the theoretical concepts of Computer Science. The course emphasizes the study of abstract computational devices and explores what problems can and cannot be computed. Key topics covered include: proof techniques, finite automata, pushdown automata and context-free grammars, computability, the universal computational model of Turing machines, time complexity theory, NP-completeness and Space Complexity.

Upon Completion of this Course, students will be able to:

1. Gain a solid understanding of the theoretical foundations of computer science:basic concepts in formal language theory, grammar, automata theory, computability theory, and complexity theory
2. Design Finite Automata's for different Regular Expressions and Languages
3. Construct context free grammar for various languages
4. Explain the concept of a Turing machine and its significance in computer science, describe how Turing machines simulate other models of computation
5. Apply theoretical knowledge gained in the course to solve practical computational problems

PREREQUISITES

CS 101 Computer Science; CS 290 Discrete Mathematics for Computer Science

GRADING

Grades will be determined by accumulating points, with 100 points being the maximum, as follows:

ITEM	POINTS
2 Quizzes	20 Points
Midterm Exam	15 Points
4 Assignments	40 Points
Final Exam	25 Points
Total	100 Points

Late submissions will be graded at the end of the course. Grades will be assigned according to the following rule:

A ≥ 90 > B ≥ 80 > C ≥ 70 > D ≥ 60 > F.

We reserve the right to make adjustments to the overall grading policy.

COURSE MATERIALS

Required Texts:

Michael Sipser, ***Introduction to the Theory of Computation***, 3rd Edition, 2013.

Recommended (Optional) Texts or Other Materials:

None

COURSE TOPICS

MODULE	TASKS
Module 1	**Topics:** Topic 1: Proof Techniques, Finite Automata Topic 2: Nondeterminism Topic 3: Regular Expressions Topic 4: Nonregular Languages Assignment#1
Module 2	**Topics:** Topic 5: Context-Free Grammars Topic 6: Pushdown Automata Topic 7: Non-Context-Free Languages Topic 8: Deterministic Context-Free Languages Assignment#2 **Assessments:** Quiz#1

Module 3	**Topics:** Topic 9: Turing Machines, Variants of Turing Machines Topic 10: Computability Theory Topic 11: Decidability, Undecidability Topic 12: Advanced Topics in Computability Theory **Assessments:** Midterm Exam
Module 4	**Topics:** Topic 13: Complexity Theory Topic 14: Time Complexity: Measuring Complexity Topic 15: The Class P, The Class NP Topic 16: NP-completeness Assignment#3 **Assessments:** Quiz#2
Module 5	**Topics:** Topic 17: Additional NP-complete Problems Topic 18: Space Complexity Topic 19: Intractability Topic 20: Advanced Topics in Complexity Theory Assignment#4 **Assessments:** Final Exam

ATTENDANCE

1) Class attendance is required. Missing classes without permission will lead to decrease in overall grade.

Missing less than two classes: no penalty.

Missing more than two classes: 7% will be taken off from the overall grade.

If the instructor reports a student's frequent missing of class to the Soochow University Academic Administration Office, the student might get a written warning and might be prohibited from attending final exam.

2) Participants in this course are expected to arrive in class promptly and adequately prepared. The primary objective of this course is to critically engage with the readings and the subject matter. Therefore, course participants are expected to have completed the reading prior to class and prepare thoughtful reflections/commentaries to share with fellow colleagues.

LEARNING REQUIREMENTS

1) Late assignments are not acceptable and are subjected to grade deductions.
2) Assignments submitted in the wrong format will be counted as not submitted.
3) Failure to submit or fulfill any required course component results in failure of the class.
4) Make-up for midterm and final exams only with valid excuses, as defined by the University.
5) In order to earn a Certificate of Completion, participants must thoughtfully complete all assignments by stated deadlines and earn an average quiz score of 50% or greater.

TECHNOLOGY POLICY

The use of electronic devices in class is distracting, both for the user and for the rest of the class. Only non-programmable calculators can be used in the tests and exam. Any attempts to use cell phones and other electronic communication devices will be seemed as cheating. Laptops are discouraged, unless you use them for activities DIRECTLY related to the course (eg., note taking, reading course documents).

ACEDEMIC INTEGRITY POLICY

Soochow University highly values the academic integrity and aims to promote the academic fairness, honesty and responsibility. Any academic dishonesty behaviors and any attempts to cheats and plagiarism will be reported to the university administration office. A written warning and the relevant penalties will be imposed. The record might be shown on the official university transcript.

DISABILITY ACCOMMODATION

Soochow University is committed to maintaining a barrier-free environment so that students with disabilities can fully access programs, courses, services, and activities at Soochow University. Students with disabilities who require accommodations for access to and/or participation in this course are welcome.

Note:

Please contact the University Administrative Office immediately if you have a

learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material.