



蘇州大學
Soochow University

CS 356 Analysis and Design of Algorithms I

Summer 2024

Course Credits: 4

Contact Hours: 56 hours

Instructor: TBA

Email: TBA

COURSE OBJECTIVES

The course provides a comprehensive introduction to the analysis and design of algorithms. Students will know how to analyse algorithms and learn about various algorithm design techniques such as divide-and-conquer, dynamic programming, greedy, and brute force. They will also examine the correctness of algorithms, complexity analysis of algorithms, and complexity theory including lower bound arguments, NP-Completeness, dealing with NP-complete problems. In addition, advanced algorithms and data structures in different areas such as trees and graphs will be explored.

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

1. Learn good principles of algorithm design;
2. Know how to analyse algorithms and estimate their worst-case and average-case behaviour;
3. Explore different algorithm design techniques and be able to choose appropriate algorithmic design techniques for different problem scenarios;
4. Understand basic complexity classes and the relationships between them, including P, NP, and NP-complete;
5. Investigate advanced algorithms and data structures, particularly in the domains of trees and graphs;
6. Be able to apply learned concepts to solve real-world computational problems.

PREREQUISITES

CS 258 Data Structures and Algorithms



GRADING

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

ITEM	POINTS
Problem Sets	20 Points
Quizzes	20 Points
Midterm	25 Points
Final Exam	35 Points
Total	100 Points

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

$$A \geq 90 > B \geq 80 > C \geq 70 > D \geq 60 > F.$$

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

COURSE MATERIALS

Required Texts:

Thomas H. Cormen; Charles E. Leiserson; Ronald L. Rivest; Clifford Stein, *Introduction to Algorithms*, 4th Edition, The MIT Press, 2022.

Recommended (Optional) Texts or Other Materials:

None

COURSE TOPICS

MODULE	TASKS
Module 1	Topics: Topic 1: Introduction to Algorithms Topic 2: Analysis and Design of Algorithms Topic 3: Asymptotic Notation Topic 4: Average and Worst-case Analysis Assessments: Problem Set#1



Module 2	Topics: Topic 5: Divide-and-Conquer Topic 6: Probabilistic Analysis Topic 7: Randomized Algorithms Topic 8: Amortized Analysis Assessments: Quiz#1
Module 3	Topics: Topic 9: Amortized Analysis (Cont.) Topic 10: Data Structures Topic 11: Dynamic Programming Topic 12: Dynamic Programming (Cont.) Assessments: Midterm
Module 4	Topics: Topic 13: Greedy Algorithms Topic 14: Brute Force Topic 15: Graph Representation and Basic Algorithms Topic 16: Minimum Spanning Trees Assessments: Problem Set#2 Quiz#2
Module 5	Topics: Topic 17: Shortest Paths Topic 18: Maximum Flow Topic 19: Computational Complexity: lower bound arguments Topic 20: NP-Completeness & Dealing with NP-complete problems 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).

ACADEMIC 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



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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.