CS 123 Introduction to Algorithms

Summer 2023

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

COURSE OBJECTIVES

This course covers the analysis and design of algorithms, including algorithmic complexity, asymptotic analysis, algorithm design patterns, and optimization techniques. Topics include sorting algorithms, graph algorithms, dynamic programming, and greedy algorithms, as well as algorithmic paradigms such as divide-and-conquer and randomized algorithms. The course will also cover the ethical implications of algorithmic decision making.

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

1. Apply algorithm analysis techniques to evaluate the performance of various algorithms
2. Design and implement efficient algorithms to solve problems
3. Recognize and apply algorithm design patterns, such as greedy algorithms, dynamic programming, and divide-and-conquer
4. Evaluate the correctness and efficiency of algorithms using mathematical proofs and empirical analysis
5. Identify the strengths and limitations of different algorithmic approaches for different problem domains
6. Apply algorithmic thinking to real-world problems, and develop effective problem-solving strategies
7. Communicate algorithmic ideas and analysis results effectively, both verbally and in writing
8. Use algorithmic analysis tools and software, such as Big-O notation, asymptotic analysis, and algorithm visualization tools.

PREREQUISITES

MAT 240 Discrete Mathematics; CS 100 Introductory Computer Science

GRADING

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

ITEM	POINTS
Problem Sets	20 Points
Midterm	20 Points
Programming Assignment	20 Points
Final Project	40 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:

Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C. (2009). ***Introduction to Algorithms***, 3rd Edition. MIT Press.

Recommended (Optional) Texts or Other Materials:

None

COURSE TOPICS

MODULE	TASKS

Module 1	**Topics:** Topic 1: Basics of Algorithm Analysis Topic 2: Big-O Notation, Asymptotic Analysis Topic 3: Worst-Case and Average-Case Analysis Topic 4: Sorting Algorithms **Assessments:** Problem Set#1
Module 2	**Topics:** Topic 5: Selection Sort, Insertion Sort, Merge Sort, Quicksort, Heap Sort Topic 6: Greedy Algorithms Topic 7: Activity Selection Problem, Huffman Coding and Data Compression Topic 8: Minimum Spanning Tree Problem **Assessments:** Problem Set#2
Module 3	**Topics:** Topic 9: Divide-and-Conquer Algorithms Topic 10: A First Recurrence: The Mergesort Algorithms Topic 11: Further Recurrence Relations Topic 12: Binary Search, Closest Pair of Points **Assessments:** Midterm
Module 4	**Topics:** Topic 13: Dynamic Programming Algorithms Topic 14: Segmented Least Square: Multiple-Way Choices Topic 15: Subset Sums and Knapsacks: Adding a Variable Topic 16: Sequence Alignment **Assessments:** Programming Assignment
Module 5	**Topics:** Topic 17: Randomized Algorithms Topic 18: Randomized Quicksort, Monte Carlo Algorithms,and Las Vegas Algorithms Topic 19: Topic 20: Ethical Implications of Algorithmic Decision Making **Assessments:** Final Project

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.