Soochow University

CS 360 Advanced Data Structures and Algorithms

Winter 2024

Course Credits: 4
Contact Hours: 56 hours
Instructor: TBA
Email:TBA

COURSE OBJECTIVES

It is an advanced course that builds upon the foundational concepts covered in CS 258 Data Structures and Algorithms. This course focuses on more complex data structures and algorithms commonly used in computer science and software engineering, such as trees, graphs and heaps, etc. Specific topics to be covered include random binary search trees, balanced trees, augmenting datastructures, strings, tries, mergeable data structures, and sets. Through the course, students will learn how to select and use these different data structures to solve specific problems and apply this knowledge to solve real-world programming challenges.

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

1. Understand the knowledge of more complex data structures and algorithms

2. Gain an understanding of how to effectively utilize more complex data structures to efficiently solve specific programming problems

3. Develop the ability to design, implement, and analyze crucial data structures

4. Gain proficiency in utilizing advanced analytical techniques

5. Apply the knowledge learned from this course to solve real-world programming challenges

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
Assignments	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 ≥ 90 > B ≥ 80 > C ≥ 70 > D ≥ 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.

Recommended (Optional) Texts or Other Materials:

None

COURSE TOPICS

MODULE	TASKS
Module 1	**Topics:** Topic 1: Foundations of Algorithms Topic 2: Analyzing Algorithms & Designing Algorithms Topic 3: Introduction to Data Structures Topic 4: Hash Tables **Assessments:** Assignment#1

Module 2	**Topics:** Topic 5: Random Binary Search Tree Topic 6: Random Binary Search Tree (Cont.) Topic 7: Average Case Analysis Topic 8: Skiplists & Treaps **Assessments:** Quiz#1
Module 3	**Topics:** Topic 9: Augmenting Data Structures Topic 10: Augmented Treaps & Interval Trees Topic 11: B-Trees Topic 12: Ropes **Assessments:** Midterm
Module 4	Topics: Topic 13: Analyses for Graphs Topic 14: Graphs: Adjacency Matrices & Adjacency Lists Topic 15: Graphs: Depth-First Search & breadth-First Search Topic 16: R-Way Tries & Ternary Trees Assessments: Assignment#2 Quiz#2
Module 5	**Topics:** Topic 17: Mergeable Data Structures: Binomial Heaps Topic 18: Sets and Quad Trees: Disjoint Forest & Quad Trees Topic 19: Sets and Quad Trees: Disjoint Forest & Quad Trees (Cont.) Topic 20: Final Exam Reviews **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.