CIS 477: Introduction to Analysis of Algorithms
Spring 2026

Lecture: 241 Sims Hall, Monday and Wednesday 2:15 - 3:35 pm
Recitation 1: 221D Shaffer Art Building, Tuesday 9:30 – 10:25 am
Recitation 2: 221D Shaffer Art Building, Tuesday 11:00 – 11:55 am

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Instructor

Junzhe Zhang, 315-443-5727, jzhan403@syr.edu

Office Hours: 4-297 CST, Monday and Wednesday 3:45 – 4:45 pm

TA

Ruipeng Liu, rliu02@syr.edu

Office Hours: 3-224 CST, Wednesday 10 am - 11 am

Prerequisite

CIS 375 (Introduction to Discrete Mathematics) and CIS 351 (Data Structures)

Description

Mathematical modeling of computational problems; searching and sorting algorithms; search trees, heaps, and hash tables; divide-and-conquer, dynamic programming, and greedy choice design techniques; graph algorithms; introduction to cryptography; NP- completeness; and selected topics.

Objectives

At the end of the course, students will be able to:

a. Design algorithms to solve a variety of problems;

b. Understand techniques such as greedy algorithms, divide-and-conquer, and dynamic programming as well as limitations and applicability of these techniques, and determine when they are suitable;

c. Explain and apply basic cryptography techniques;

d. Analyze the running time and correctness of algorithms;

e. Understand Big-O notation and use it to describe the running time of an algorithm;

f. Understand computational complexity, and determine the complexity class of various problems.

Textbook

Thomas H. Cormen, Charles E. Leiserson, Ronald Rivest, and Clifford Stein, 2022,

Introduction To Algorithms, (4th edition) MIT Press, ISBN: 978-0262046305.

Homework

Total of 6 exercises; Will NOT be collected or graded. Solutions will be provided. Students must work on them on time to be prepared for quizzes and exams.

Quiz

About 9 in-class short quizzes through the semester to keep up with course materials. Lowest two of assigned quizzes will be dropped. *No make-ups will be given even with valid excused absense from Orange Success.*

Assessment

15% Quiz: 9 sets of in-class questions; drop lowest 2; equal weight

60% Midterms: 3 midterm exams; equal weight

a. Midterm 1: February 9 (Monday) 2:15 – 3:15 pm in main class period
b. Midterm 2: March 4 (Wednesday) 2:15 – 3:15 pm in main class period
c. Midterm 3: April 8 (Wednesday) 2:15 – 3:15 pm in main class period

25% Final Exam: (Comprehensive) April 30 (Thursday) 12:45- 2:45 pm

In addition, there will be extra credit for class participation (see Attendance). Pay careful attention to exam locations and times. If an exam is missed, you must have an **authorized excuse from Orange Success** to get a make-up. Let me know before the exam (ideally); otherwise, I must be notified within two days of your return to school.

Grades

The letter grades are 95-100% gets an A, 90-95% gets an A-, 85-90% gets a B+, 80-85% gets a B, 75-80% gets a B-, 70-75% gets a C+, 65-70% gets a C, 60-65% gets a C-, 55-60% gets a D, and less than 55% gets an F.

Note

- Check your email often (at least once on the day of class or the night before class).
- Make sure you have forwarded your SU mails to a "reasonable" place.
- Keep a scientific calculator for classes and exams.
- Unless instructed otherwise, use of electronic devices are strictly prohibited in class.

Attendance

It is expected that you attend all classes unless Orange Success can send me an excused absence note. Most often, excused absences include being sick, attending an academic conference, and representing the department/college/university in some event. The instructor must be informed at least an hour before class to be eligible for a possible excuse, however valid it may be. Even with a valid excuse, quizzes will not be made up under any circumstances. Also, while in class, it is expected that you will pay attention, behave respectfully, and participate in class activities. At the instructor's discretion, students who actively participate in the in-class

discussion for each lecture will receive extra credit worth 1%. The cumulative extra credits will not surpass 5%.

Lateness

Deadlines will be strictly enforced. Any quizzes or exams turned in after the time expires will automatically be given a zero.

Policies

See Appendix Document for policies related to:

- Syracuse University Policies
- Diversity and Disability
- Religious Observances Notification Policy
- Orange Success
- Academic Integrity
- Use of Turnitin

Topic Outline (Tentative)

Topic 0 (0.5 weeks) *Introduction* CLRS Chapter 1

Background; role of algorithms, algorithms as a technology

Topic 1 (1 week) *Algorithm Running Times* CLRS Chapters 2-3

Obtaining running times *T(n);* insertion sort, merge sort examples; characterizing running times (Big-O, Ω, θ)

Topic 2 (2.5 weeks) *Sorting Analysis* CLRS Chapters 4, 6-8

Divide and conquer; recurrence relations; heap sort; quicksort; sorting in linear time (special cases)

Topic 3 (1.5 week) *Searching Efficiently* CLRS Chapters 10-12

Tree-based search; hash tables; cryptography; binary search tree

Topic 4 (1.5 weeks) *Dynamic Programming* CLRS Chapter 14

Compare against divide and conquer; basic idea using rod cutting; applications to knapsack and linearized DAG

Topic 5 (1 week) *Greedy Algorithms* CLRS Chapters 15, 21

Activity selection example; knapsack example; minimum spanning tree (Kruskal and Prim algorithms)

Topic 6 (4 weeks) *Graph Algorithms* CLRS Chapters 20, 22, 24-25

Graph representation; breadth first and depth first searches; shortest path, maximum flow; matching problems

Topic 7 (2 weeks) *NP Completeness* CLRS Chapter 34

Polynomial time, NP hardness, NP completeness; verification; examples

Syllabus Appendix

Syracuse University Policies

Syracuse University has a variety of policies designed to guarantee that students live and study in a community respectful of their needs and those of fellow students. The policies can be found in https://policies.syr.edu and in particular, policies relating to academic rules, student responsibilities and services can be found in https://policies.syr.edu/policies/academic-rules-student-responsibilities-and-services/. Some of the most important of these concerns: Diversity and Disability (ensuring that students are aware of their rights and responsibilities in a diverse, inclusive, accessible, bias-free campus community) can be found here, at: https://www.syracuse.edu/life/accessibilitydiversity/.

Diversity and Disability

Syracuse University values diversity and inclusion; we are committed to a climate of mutual respect and full participation. There may be aspects of the instruction or design of this course that result in barriers to your inclusion and full participation in this course. I invite any student to meet with me to discuss strategies and/or accommodations (academic adjustments) that may be essential to your success and to collaborate with the Center for Disability Resources (CDR) in this process.

If you would like to discuss disability-accommodations or register with CDR, please visit their website at https://disabilityresources.syr.edu. Please call {315) 443-4498 or email disabilityresources@syr.edu for more detailed information.

CDR is responsible for coordinating disability-related academic accommodations and will work with the student to develop an access plan. Since academic accommodations may require early planning and generally are not provided retroactively, please contact CDR as soon as possible to begin this process.

Religious Observances Notification Policy

SU religious observances policy recognizes the diversity of faiths represented among the campus community and protects the rights of students, faculty, and staff to observe religious holidays according to their tradition. Under the policy, students are provided an opportunity to make up any examination, study, or work requirements that may be missed due to are religious observance provided they notify their instructors before the end of the second week of classes. For fall and spring semesters, an online notification process is available through MySlice/StudentServices/Enrollment/MyReligiousObservances/AddaNotification from the first day of class until the end of the second week of class. For more information on SU's religious observance policy, see http://supolicies.syr.edu/emp_ben/religious_observance.htm.

Orange Success

This class will participate in Orange success, which promotes student success through coordination and communication among students, instructors, advisors, and campus support service departments. If I

observe that you are experiencing difficulties in the course (attendance concerns, low test scores or participation, in danger of failing, etc.), I may send an email to your syr.edu email account through the Orange success system. My message will tell you about my concerns and ask you to meet with me or an academic advisor. Your advisor, TA, and/or I will work with you to create success strategies to address your difficultie. In addition, if I observe that you are doing well in my course, you may also receive "kudos" from me acknowledging your efforts.

Orange success may involve taking advantage of various campus support services, such as academic tutoring or advising. If I recommend that you use campus support services, I or your advisor will redirect you to that support office so they will be better prepared to assist you.

Orange success provides essential notices by email and/or text. Please check your syr.edu account frequently and respond quickly if you receive an email from Orange success.

Note that independent testing has shown that Orange success is now compliant with international accessibility standards (WCAG 2.0). Please see the Orange success website for additional details: http://orangesuccess.syr.edu/aboutus/accessibility-update/

We appreciate your ongoing dedication and support to our students and their academic success at Syracuse University. Please contact us with any questions or concerns at orangesuccess@syr.edu.

Academic Integrity

Syracuse University's Academic Integrity Policy reflects the high value that we, as a university community, place on honesty in academic work. The policy holds students accountable for the integrity of all work they submit and for upholding course-specific, as well as university-wide, academic integrity expectations. The policy governs citation and use of sources, the integrity of work submitted in exams and assignments, and truthfulness in all academic matters, including course attendance and participation. The policy also prohibits students from: 1) submitting the same work in more than one class without receiving advance written authorization from both instructors and, 2) using websites that charge fees or require uploading of course materials to obtain exam solutions or assignments completed by others and present the work as their own. Per the policy guidelines, instructors will penalize a student for a suspected violation by first reporting the violation to the Center for learning and Student Success (CLASS). Upholding Academic Integrity includes abiding by instructors' individual course expectations, which may include the protection of their intellectual property. Students should not upload, distribute, or otherwise share instructors' course materials without permission. Students found in violation of the policy are subject to grade sanctions determined by the course instructor and non-grade sanctions determined by the School or College where the course is offered, as described in the Violation and Sanction Classification Rubric. The Violation and Sanction Classification Rubric establishes recommended guidelines for the determination of grade penalties by faculty and instructors. Any established violation in this course may result in course failure regardless of violation level.

Use of Artificial Intelligence

All generative-AI tools are prohibited in this course because their use inhibits achievement of the course learning objectives. This policy applies to all stages of project and writing processes

including researching, brainstorming, outlining, organizing, and polishing. Do not use Generative-AI tools to create any content (i.e., images and video, audio, text, code, etc.). If you have any questions about a feature and whether it is considered Generative-AI, ask your instructor.

Use of Turnitin

N/A