CS3510 Design and Analysis of Algorithms

Disclaimer

This syllabus is subject to minor modifications as needed before the drop/add deadline.

Course Information

- **Instructor:** Rose McCarty (rmccarty3@gatech.edu)
- **Course:** CS 3510 Section B (CRN 88385)
- **Term:** Fall 2026
- **Meeting time:** Tuesday and Thursday, 2:00pm to 3.15pm, room TBA

Course Description

This is a course in the fundamentals of algorithm design and analysis. Algorithms are ubiquitous and govern the modern world through data analysis, search, machine learning, and cryptography. The ability to design correct and efficient algorithms is the key to unlocking their power. The mathematical analysis of algorithms provides the rigorous foundation needed to evaluate and compare different algorithms' performance and scalability to large instances. By the end of this course, you will have a strong foundation in the principles of algorithm design and the ability to analyze their performance.

Course Learning Outcomes

Upon successful completion of this course, you should be able to

- describe the run-time of an algorithm using big-O notation;
- recognize which technique is likely to lead to a fast algorithm for solving a problem;
- apply techniques such as divide and conquer and dynamic programming;
- perform graph algorithms for problems such as shortest paths and maximum matching;
- understand the meaning of P versus NP and prove that a problem is NP-complete.

Additional topics that we may cover in the last couple of weeks include linear programs, approximation, and/or randomness.

Required Course Materials

The book *Algorithms* by S. Dasgupta, C. Papadimitriou, and U. Vazirani is required.

Grading

Your overall score in the class is formed by your **exam score** (worth 80%) and your **homework score** (worth 20%). To get the grades A, B, C, D, you need to earn 90%, 80%, 70%, and 60% in the course, respectively. I will round the overall score to the nearest integer. So for instance an 89.5% will be rounded up to an A, while an 89.4% is still a B.

Exams. There are **three in-class exams** that will occur during the normally scheduled class time on the following dates:

- Thursday, September 17
- Thursday, October 22
- Thursday, November 19

There is also a **cumulative final exam** held during the final exam period. Each of the three in-class exams and the final exam is worth 20% of the overall course grade. So together the exams count for 80% of the overall course grade. Moreover, if it helps your grade, then your score on the final exam will also **replace** your lowest scoring exam of the three in-class exams.

Homework. Homeworks will be due on **Tuesdays at 11:59pm**. Most weeks will have a homework, with a break the week after each exam and the final week of class. There will be 9-10 homeworks total, and each homework counts for an equal portion of the grade. In total, homework counts for 20% of your overall course grade. This relatively high frequency of homeworks is designed to benefit you, so that you can regularly practice the material in shorter bursts.

- Your **lowest two homework grades** will be dropped.
- **Late homework** is accepted for 48 hours after the deadline at a penalty of 25%. So for instance a homework that would have earned 80% if turned in on time would earn 60% if late. This penalty will be applied automatically and there are no exceptions, even if the homework is only 5 minutes late. No homeworks will be accepted more than 48 hours after the deadline.
- Homework must be turned in on **Gradescope**. You can find the link on Canvas.
- Solutions **must be typewritten**. Handwritten solutions will not be accepted. LaTeX is strongly recommended. You can find templates to use at overleaf.com.
- You are encouraged to collaborate and work in groups, but you must write your own solutions. You must write the names of students you worked with on your homework.
- You may look up reference material online and in textbooks to help with your homework. You may also use AI / LLM's / chatGPT to help with both homework and studying. (For instance, asking chatGPT to give you an interactive quiz based on the topic list for an exam.) This policy is intended to reflect the growing impact that AI will have on the day-to-day performance of your job once you graduate. However, please note that you will NOT have access to any of this material on the exams! It IS considered cheating to use any other resources on the exams besides scratch paper. This reflects the fact that in real life, you will not usually have access to these tools at in-person technical interviews.

  Homework is designed to help you learn the material and thus prepare for the exams. If your performance is significantly better on the homeworks than on the exams, please re-evaluate your AI usage. I

strongly recommend that you attempt to do the homework without any outside materials first. If you get stuck on a problem, it is also more helpful for you to think it through with the aid of your classmates, the TAs, and me in office hours than to just ask AI to solve the question (or you could ask AI to answer the question as if it was the instructor for the course). All of this being said, if you can use AI to make your workflow more efficient, then by all means please do so.

Curves. While I do not generally expect to curve exam grades, it does occasionally happen. If there is a curve, it will be announced when exam grades are returned. Any curve will only improve your grade. Your grade on Gradescope will appear without the curve, and your grade on Canvas will include the curve.

Please note that I do NOT curve the overall course grade; whatever grades you are getting on the exams (and to a lesser extent the homework) accurately reflect how well you are doing in the course so far. So if you are not satisfied with your performance on the exams, then you should take corrective action immediately. I am always available in office hours to discuss study strategies and what you can do differently.

Missed exam policy. If you miss an exam for an officially excused reason (such as sickness or presenting research at a conference – please note things like a planned vacation or a missed alarm are not excused), please get a letter from the Office of the Dean of Students as soon as possible. You also need to email me to confirm that I received the letter and have scheduled you for a make-up exam. I will only schedule a make-up exam if I have received the letter in a timely fashion. The make-up exam will be **December 8th**, in class.

Regrade requests. Regrade requests must be submitted within **1 week** from when the grade was returned. Regrade requests must be submitted on **Gradescope** and must **include a justification**. Regrade requests will not be considered on the basis of a grader not understanding your solution. It is your responsibility to make your answers clear for the graders to understand. We reserve the right to lower your grade on the specific problem for which a regrade request is submitted.

Attendance Policy

Lecture attendance is **mandatory**. This means that if you miss class, it is your responsibility to make up the material on your own. I do not take attendance, however, and there is no need to contact me about missing class. I will update a **course calendar on Canvas** as we go through the course. Each day's material will be updated by the end of the day on which the lecture is given. This calendar will list 1) the general topic covered and 2) the corresponding reading.

The reading is optional for those who attended the lecture. However, I do recommend doing the reading, especially for topics where you feel you could benefit from some more time spent on the subject. I will make an effort to ensure that all of the required topics can be learned from the reading alone, as I know it is sometimes necessary for students to miss class. However, keep in mind that the reading is a secondary resource and lectures are still considered mandatory. If you miss a class, I recommend also getting lecture notes from a friend. You can also request lecture notes from other students anonymously on Piazza.

Academic Honesty/Integrity Statement

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review the Student Code of Conduct and the Academic Honor Code.

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for

violations. Allegations of scientific or scholarly misconduct are handled in accordance with the procedures outlined by the Policy for Responding to Allegations of Scientific or Other Scholarly Misconduct.

Core IMPACTS

Not applicable.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter.

Student-Faculty Expectations

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgment, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulates some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.