

CSCI-4260/MATH-4150: Graph Theory

www.cs.rpi.edu/~slotag/classes/SP22t/index.html

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Office Hours: Monday/Thursday 12-1pm and by appointment
<https://rensselaer.webex.com/meet/slotag>

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Class Hours: 10-11:50am Monday/Thursday
Check course website for Webex Event Links during virtual class

1 Course Description

This course discusses fundamental concepts of Graph Theory and its applications in computer, social, and natural sciences. The topics include: graphs as models; representation of graphs; trees; universal trees; distances; matchings; connectivity; flows in networks; colorings; cycles; planarity; and other computational problems and algorithms. Concepts and methods will be presented through proofs, exercises, and applications.

1.1 Prerequisites

Students should have taken a course in discrete mathematics, such as CSCI-2200 Foundations of Compute Science or MATH-4090 Foundation of Analysis. Additionally, although not formally required, it's useful for students should have moderate programming experience to best understand the coding-based application demonstrations and algorithmic discussion.

Students will not be required to write their own code, although knowledge and understanding of algorithms, complexity, and basic data structures is **very useful**.

1.2 Course Resources

The course textbook is *Introduction to Graph Theory - 2nd Edition* by Douglas B. West. The textbook can be found at the student bookstore or online through Amazon/Ebay/“etc”. Course notes, code, and additional resources will be available through the course website. While it isn’t *absolutely necessary* to acquire the book to succeed in the course, it is still *highly recommended*.

2 Course Schedule

Classes will meet every Monday and Thursday at 10am up through April 25th. The first three courses will be via Webex. Check the website for links to each Webex Event. After that, class will hopefully be in person in Ricketts 203.

For an up-to-date schedule with class notes and content, check the website.

3 Coursework and Grading Policies

Exam policy: There will be one in-class midterm exam worth 20% of the course grade and an in-class final worth 30% of the course grade. **Exams will be closed notes, closed book, and closed neighbor.** There will be no makeups for exams unless there is either a verifiable department-approved excuse or a prior arrangement is made with the instructor. Students who know they are going to miss a test must notify me in advance. Special circumstances can be accommodated only if I am notified about them in advance. Any questions about scores or grading must be discussed ASAP with the instructor, especially before final grades are posted.

Homework policy: Homeworks will comprise 40% of the course grade. There will be approximately 6-7 homeworks throughout the semester, on a bi-weekly basis. Working together on homeworks is allowed, so you can discuss general approaches, proof techniques, etc. However, you can’t just copy+paste each others’ work. You need to complete everything on your own. You will have three late days to use for homework submissions (max two late days on one assignment). No other late submissions will be accepted outside of extenuating circumstances. Homeworks will be collected in Submittify for the entire duration of the course.

Quiz policy: Quizzes will comprise 10% of the course grade. There will be approximately 14 quizzes throughout the semester, on a weekly basis. Quizzes will be open book and open classmate – consider them as practice of the material versus an formal actual “quiz” – **but you must still complete all problems on your own.** While classes are virtual, quizzes

will be collected via Submittly, with a due date about 24 hours after release. For in-person classes, quizzes will be distributed and collected during class time. In either case, no late quizzes will be collected.

Grade Modifiers Policy: Grade modifiers will be used in this class. You can expect to earn a B- if your score is greater than 79.5 and less than 83, B if your score is greater than 83 and less than 86, B+ if your score is greater than 86 and less than 89.5. The similar modifier points occur for the A, C and D ranges except that there is no A+ nor D- under the RPI Grade Modifier Policy. **Requests for grade changes will be ignored, unless there was an identifiable error on my/a TA's part.**

Curve Policy: Curves will be applied to exam and final grades up to the discretion of the instructor. I usually just use a flat point adjustment to change the arithmetic mean grade. This means that you can't rely on a big ol' curve to boost up your grade if you're in the tail of the distribution; but if you do all the work and put in time studying, you'll probably do quite well. This course isn't intended to be exceptionally difficult.

4 COVID-19 Era Policies

Classes will be done live via Webex for the first two weeks, with recordings posted online to YouTube. See the course website for video links. I will try to post lectures as soon as possible, but the edit→encode→upload→process procedure can take multiple hours, even if everything goes smoothly.

As noted above, homework assignments and the first couple quizzes will be collected in Submittly. However, the course website will be the primary means for distributing class notes, assignments, and links to recordings.

5 Academic Integrity

Collaboration is fully allowed for quizzes, partially allowed for homeworks, but is completely forbidden for exams. You may also not bring crib sheets to examinations. For quizzes and homeworks, you are still **required to complete every problem on your own**. You can't just share and copy answers, but you can share ideas and approaches. This means that turning in an identical copy of your classwork's work or otherwise misrepresenting another person's work as your own will be considered an academic integrity violation. Don't be lazy.

The evaluation of student performance is a service provided by Rensselaer. Attempts to undermine this service lower Rensselaer's reputation. Therefore, it is essential that academic honesty be preserved. Students who violate the spirit or letter of these rules are subject to penalties according to the principles outlined in the Rensselaer Handbook:

<https://info.rpi.edu/sites/default/files/Handbook-of-Student-Rights-and-Responsibilities-Rev-August-29-2019.pdf>

In this class, first-time violations to the above policies will result in a zero on the homework/quiz/exam with which the violation occurred. Any subsequent violations will result in failure of the course. These punishments are up to the discretion of the instructor, but, generally speaking, I probably won't be particularly forgiving for egregious violations.

6 Policies for a Healthy Learning Environment

We are all different. The instructor will do his best to create an open and welcoming learning environment for all students. In this class, there is a zero-tolerance policy for harassment, bullying, racism, sexism, or any other behaviors that negatively harm this open and welcoming environment. The instructor reserves the right to immediately fail you, remove the course from your registration, banish you from the class forever, and refer you to the school for further disciplinary action should you violate this policy.

7 Disability Service for Students

Please contact me as soon as possible if you require any accommodations for the course.

8 Learning Outcomes

At the end of this course, you will:

- understand some of the main topics and results in basic Graph Theory
- gain problem solving skills and proof techniques for problems on graphs
- have learned several graph applications and algorithms
- recognize that everything is a graph