CSCI-4260/MATH-4150: Graph Theory
www.cs.rpi.edu/~slotag/classes/SP21/index.html

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Office Hours: Tuesday 5-6pm, Thursday 7-8pm, and by appointment
https://rensselaer.webex.com/meet/slotag

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Mentor: Chris Jerrett, jerrec@rpi.edu
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Class Hours: 2:30-4:20pm T/F via Webex
Check course website for Webex Event Links

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 buy the book to succeed in the course, it is still *highly recommended*.

2 Course Schedule

Classes will meet every Tuesday and Friday at 2:30pm up through April 29th via Webex. Check the website for links to each Webex Event.

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

3 Coursework and Grading Policies

The good news is: due to the difficulties of organizing and fairly mediating formal exams in a virtual course taken by students all over the world, this class will have no exams. The bad news is: homeworks will be significantly more substantial than in prior years. There will also likely be one final comprehensive homework (open book take-home exam) in lieu of a final. Weekly "checkpoint" quizzes will remain, however, but will not be solely conducted during class time.

Exam policy: N/A.

Homework policy: Homeworks will comprise 80% of the course grade. There will be approximately 7 homeworks throughout the semester, on a bi-weekly basis. Collaboration is allowed on homeworks, **but you must still complete all problems on your own**. Homework submissions will be collected in Submitty. The last comprehensive take-home final will be longer and worth more credit than typical assignments.

Quiz policy: Quizzes will comprise 20% 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**. Quizzes will also be collected in Submitty. Compared to homeworks, time to complete and submit quizzes will be substantially shorter – i.e., expect quizzes to be released after class on Friday and due by Saturday at noon.

Late submission policy: Students will be given a total of 5 late days in Submitty, with a maximum of 1 late day per assignment. No additional time will be given, as we will generally be going through homework solutions during the subsequent class.

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. As the exams for this course have traditionally been the most difficult part, I don't expect much of curve happening this semester.

4 COVID-19 Era Policies

Classes will be done live via Webex, 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.

This will be my first "synchronous" course, so bear with me for any technical difficulties. Because the lectures will be posted and assignments done and collected outside of class hours, I gave the go ahead for a number of you take the course asynchronously. **This is entirely at your own risk**. I can not guarantee that there will be no technical difficulties with recording and posting lectures.

As noted above, all assignments will be collected in Submitty. However, the course website will be the primary means for distributing class notes, assignments, and links to recordings.

5 Academic Integrity

Collaboration is allowed for quizzes and with homeworks. However, 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 Disability Service for Students

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

7 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