Welcome to Math 443, Graph Theory for honours students!

Overview

From the **calendar**:

> *Introductory course in mostly non-algorithmic topics including: planarity and Kuratowski's theorem, graph colouring, graph minors, random graphs, cycles in graphs, Ramsey theory, extremal graph theory. Proofs emphasized. Intended for Honours students.*
>
> *Pre-reqs: A score of 68% or higher in one of **MATH 220**, **MATH 226**, **CPSC 121**. (And at least 6 credits of Mathematics courses numbered 300 or above.)*

Instructor

Instructor: Dr. Elyse Yeager. You may contact me on Canvas by navigating to the inbox and writing "Elyse Yeager" in the "to" section of a new message.

Starting the second week of classes, office hours will be held [TBD] in room 229F of the math building. Office hours won't take place on days with no classes.

Textbook

We will be mostly following *A First Course in Graph Theory* by Chartrand and Zhang. You may find it useful as a reference, but purchasing it is not required. I saw it on Amazon.ca for about thirty dollars. Content warning for this book: it contains short biographies about relevant mathematicians, who had complicated and sometimes tragic lives. There is at least one mention of suicide, and several mentions of work camps.

Assessment

20% Weekly homework

You'll have homework assignments due most Mondays *before* class. Submit your solutions as a pdf online to Canvas. (LaTeX is the gold standard, but you can also export a different file type as a pdf, or scan handwritten work.) Some (but maybe not all) of the problems will be graded by our graduate TA. Your work will be judged on its entire explanation, not just the final answer, so make sure you justify and show your work. The lowest HW score will be dropped.

You may work together to generate ideas, but everyone should submit their own solutions in their own words. Exact or near-exact phrasing repeated between students will be treated as plagiarism, reported to the undergraduate chair, and result in a 0 on the assignment for the first infraction.

40% Midterms

There will be two in-class midterms: [dates]. Each midterm will be worth 20% of your final mark.

Midterms will partly measure your retained knowledge of topics from class, and partly ask you to apply that knowledge in a new setting.

5% Presentations

You will be responsible for giving an in-class presentation on a research paper. I'll have some papers for you to choose from, or you can suggest your own (subject to approval).

This is an opportunity for you to practice giving technical talks to an audience of your peers, and reading technical papers. You will find the rubric on the assignment on Canvas closer to the end of term. You'll also be asked to write a short reflection on how your own presenting might be improved.

Something that I love about graph theory is how accessible a lot of research problems are. Lots of results are coming out that are accessible to undergraduates with just a term or two of classes.

35% Final Exam

Cumulative 2.5-hour exam, scheduled by the university. Similar to midterms, but longer and broader.

Policies

Homework will be accepted up to two days late with a penalty of 5 percent points. In other words, you more or less have a grace period to submit in the next class after the due date. A midterm missed for a legitimate reason (e.g. illness) will have its weight shifted to the final exam. Makeup midterms will not be scheduled, due to the heavy administrative burden of writing and administering them. If there is a mistake in the grading of a piece of work, write an explanation of the mistake (not a new solution to the problem), as well as the location of the mistake (e.g. which question on which homework), and send them to me (Elyse Yeager) via Canvas.

Course Structure

A graph is a way of representing discrete objects and their connections to one another. Examples of what the "objects" could be include molecules, people, tasks, countries; examples of their "connections" are physical connections, friendships, disease-sharing contact, direct flight connections, conflicts. Being mathematicians, however, we treat graphs as purely mathematical objects. That is, we focus on their theory, not their application.

In this course, we'll cover foundational topics in graph theory. Our treatment will be proof-heavy. Depending on time, we may cover basic definitions, trees, connectivity, planarity, colouring, max flow/min cut, and extremal graph theory.

In this class, you should be exposed to basic concepts and results in graph theory, building a sufficient background to understand some areas of recent or current research. You should practice reading and writing proofs, in preparation for research activities you may engage in later in graduate school.

Classes will primarily be lecture-based, with occasional student presentations. There will be homework to practice and extend your in-class learning. Homework will be turned in on Canvas. At the end of the course, you will read and present a research paper. This will help you get used to reading scholarly work, and presenting in a conference-like setting.

UBC's Value and Policy Statement

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic

freedom. UBC provides appropriate accommodation for students with disabilities and for religious, spiritual and cultural observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available **here**.