Math 442 Graphs and Networks

Graph theory, emphasizing trees, tree growing algorithms, and proof techniques.

Other topics are chosen from shortest paths, maximum flows, minimum cost flows, matchings, and graph colouring.

Prerequisites:

3rd year standing and one of MATH 220, MATH 223, MATH 226 or CPSC 221.

This is an introduction to graph theory. There will be an emphasis on proof techniques. Topics include tours and graphs, planarity, graph colouring, trees, shortest paths, and algorithms. Since this is a Mathematics Majors course, there is a median grade of around 68%, and students are expected to perform calculations and construct rigorous proofs involving fundamental ideas of the course. This course is lecture-based and integrated with in-class activities such as small group work, question and answer sessions, and student board work.

There will be one in-class midterm exam, quiz, and final exam.

Tue Thu 14:00–15:30 Geography building, room 147.

Instructor: Prof. Jozsef Solymosi

Contact: Please use Canvas email for course-related communication.
Office: MATH 220

There will be one midterm on March 6. (classroom is yet to be determined)
The Quiz will be written on the 27th of March.

Grading:
Midterm: 25 %
Quiz: 15%
Homework: 10 %
Final: 50 %

Coursebook: Pearls in Graph Theory: A Comprehensive Introduction
by Nora Hartsfield and Gerhard Ringel

Learning Outcomes:

The overarching goal of this course is to provide students with an introduction to graph theory and its applications through proof and algorithmically. Specific objectives include:

1. Understanding graphs and networks and related algorithms that can be used to solve physical problems.
2. The application of graphs and networks to numerous settings, including colouring and maximization/minimization.
3. Investigating trees and tree-growing algorithms.
4. Studying many graphs- and network theoretic phenomena and the variety of proof techniques required to explain them.

By the end of the course, students will be able to:
Recall and identify types of graphs and networks and the criteria they satisfy.
Apply appropriate algorithms to solve studied real-world problems and adapt them to relateissuesms. This corresponds to course objective (1) above.
Demonstrate integrative knowledge by applying tools from this course to a wide variety of problems inside and outside the course content. This corresponds to course objective (2).
Appraise when a problem may be solved using trees. Differentiate between the different algorithms using trees in their use and output. This corresponds to the course objective (3).
Assemble graph-theoretic data in order to conjecture formulae and justify these and known formulae through rigorous proof. Appraise which proof technique is most appropriate to apply. This corresponds to course objective (4)

University Policies:

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise. So, there are additional resources to access, including those for survivors of sexual violence. UBC values respect for the person and ideas of all academic community members. Harassment and discrimination are not tolerated, nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and religious observances. UBC values academic honesty, and students are expected to acknowledge the ideas generated by others and uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available at https://senate.ubc.ca/policies-resources-support-student-success UBC Senate website.

Academic misconduct:

Whether you arrive at homework solutions in collaboration with others or alone, the paper you turn in with your name on it should represent your own solutions, written in your own words. In particular, you may not simply copy someone else's homework and turn it in as your own. Similarly, copying solutions you might find on the web or from another source is illegal. These will all be treated as academic misconduct. We take all academic misconduct very seriously and will follow university procedures in all cases - disciplinary measures can result in expulsion. There is anecdotal evidence that quite a bit of cheating occurs on campus. To prevent one common form of cheating, we will photocopy a random sample of exams before returning them.

Homework and exams:

We will not accept late homework. Calculators, books, notes etc. are not permitted in either exam; however, bring your student ID to both exams. There are no make-up or alternate exams, so make sure you do not make personal travel plans or work plans etc., that will conflict. Any student who misses the midterm exam is to present to their instructor the Department of Mathematics self-declaration form for reporting a missed assessment **within 72 hours of the midterm exam date**. This policy conforms with the UBC Vancouver Senate's Academic Concession Policy V-135, and students are advised to read this policy carefully. If a concession is made, the midterm exam or quiz is weighted to the other exam (midterm/quiz) and the final exam.