Math 443 Course Syllabus 23W T1

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.

Credits: 3

Pre-reqs: A score of 68% or higher in one of [MATH 220](#), [MATH 223](#), [MATH 226](#), [CPSC 121](#). (And 6 credits of MATH numbered 300 or above.)

Grading

- 50% homework (take-home, students may work in groups)
- 20% midterm (in class, closed book, individual)
- 30% final project (scaffolded group project including assignments meant to help students learn to read math research papers, culminating in group presentations in a conference-like environment)

Textbook

A first course in graph theory, by Chartrand and Zhang

Content

- Basic definitions
- Connected graphs
- Common classes of graphs
- Graph degree
- Walks and closed walks
- Regular graphs
- Degree sequences, Havel-Hakimi theorem
- Graph reconstruction conjecture and results, Kelly's theorem about disconnected graphs
- Trees
- Minimum spanning trees and Kruskal's algorithm
- Cayley's tree formula
- Vertex- and edge connectivity
- Blocks
- Menger's Theorem
- Eulerian circuits
- Hamiltonicity
- Planarity, Kuratowski's Theorem with partial proof

- Discharging
- Colouring (vertex and edge)
- Heawood's theorem with proof
- Four colour theorem, with notes on proof and history
- Embedding graphs on surfaces
- Ramsey numbers, with proofs of several results
- Time permitting: Turan's theorem, modified Ramsey numbers, random graphs, crossing number