MATH 350 – HONOURS DISCRETE MATHEMATICS

Fall 2023

Instructor: Sergey Norin

Office: Room 1116, Burnside Building

Office hours: Tuesday, Thursday, 12:30 - 1:30PM in person or on Zoom at https://mcgill.zoom.us/j/88928248808

Reserve your office hour slots at https://supersaas.com/schedule/snorinmcgill/MATH_350

Piazza: https://piazza.com/mcgill.ca/fall2023/math350

Email: sergey.norin@mcgill.ca

Lecture:

Time: Tuesday, Thursday, 2:35-3:55 PM.

Location: Maass Chemistry Building 217

Topics:

The course focuses on fundamental concepts in graph theory: trees, matchings, connectivity, graph coloring, planar graphs.

Pre-requisites:

The pre-requisites are Math235 or Math240 *and* Math 251 or Math 223.

Restrictions:

Not open to students who have taken or are taking MATH 340.

Textbooks:

There are no required textbooks. References that you may find helpful are

- *Introduction to Graph Theory* by D. West. (great source of exercises)
- *Graph Theory* by A. Bondy and U.S.R. Murty.
- *Graph Theory* by R. Diestel. (more advanced)

Grading policy:

Course grades will be based upon assignments (20%), midterm (20%), and a final exam (60%) - or assignments (20%) and final exam (80%) if this leads to a better mark.

Tentative schedule:

Week 1:	Examples of graphs, basic definitions, walks, paths, connectedness, components of a graph.
Week 2:	Trees and forests, leaves, fundamental cycles, algorithm for minimum-cost spanning tree. Counting graphs and trees. Cayley`s formula.
Week 3:	Euler tours, Euler's theorem, Hamilton cycles, Dirac's theorem, bipartite graphs
Week 4:	Matchings in bipartite graphs, Hall's and Konig's theorems
Week 5:	Vertex- and edge-connectivity, Menger's theorem, digraphs, network flows, the max-flow min-cut theorem
Week 6:	Stable sets, Gallai's equations, Ramsey theory
Week 7:	Matchings in general graphs, Tutte's theorem, Petersen's theorem.
Week 8:	Edge-coloring, Konig's theorem, Shannon's theorem, Vizing's theorem.
Week 9:	Vertex-coloring, Brooks` theorem, probabilistic constructions of graphs with large chromatic number.
Week 10:	Planar graphs, regions and cut-edges, Euler's formula, the five-color and four-color theorems.
Week 11:	Minors of graphs, examples of excluded minor theorems, Kuratowski's theorem, series-parallel and outerplanar graphs.
Week 12:	Perfect graphs, chordal graphs, the weak perfect graph theorem.
Week 13:	Algebraic methods in graph theory.
Week 14:	Review.

Academic Integrity:

McGill University values academic integrity. Therefore all students must understand the meaning and consequences of cheating, plagiarism and other academic offenses under the Code of Student Conduct and Disciplinary Procedures (see http://www.mcgill.ca/integrity for more information). Most importantly, work submitted for this course must represent your own efforts. Copying assignments or tests from any source, completely or partially, allowing others to copy your work, will not be tolerated.

Miscellaneous:

- In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or French any written work that is to be graded.
- In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.