Math 3373
Combinatorics and Graph Theory

Lakehead University – Orillia Campus
Winter 2026 Course Syllabus

Course Instructor

Name:	**Office**:	**E-mail**:
Mihai Alboiu	OR 1035	malboiu@lakeheadu.ca

Course Information

Class & Lab Meetings

- Lectures: Tuesdays & Thursdays: 11:30am – 1:00pm in OA 2015

Class Format

Before each class, you will be assigned some readings from our free online textbook. Class meetings will involve recapping the material we read before class (we will take turns recapping this material) and working through problems together to solidify our understand of the concepts. The classes will be very interactive, so you should come to class prepared to participate and engage with the material.

Course Description

Math 3373 is an introductory course on combinatorics and graph theory. As per the calendar description, we will be studying: binomial coefficients and other special number sequences, generating functions, graphs, trees, paths and connectivity, matchings, colourings, flows, and algorithms in combinatorics and graph theory.

Prerequisites & Restrictions

Prerequisites: Math 1271 or permission of the Chair of the department

Textbooks

There will be pre-class readings assigned from the following textbook:

- (*Free!*) Adams, Emmrich, Gillespie, Golden & Pries: Counting Rocks!

Course Learning Objectives

There are three overarching course learning objectives in this class:

1. Learn how to read mathematics independently, critically, and reflectively, and become familiar with the form of general mathematical exposition
    - Understand the terms *Theorem, Lemma, Proposition, Definition, Proof, Remark, Conjecture, Corollary*, and *Example*, together with their importance and significance in mathematics.
    - Generate simple examples from definitions
    - Formulate basic conjectures about number and graph sequences and patterns.
2. Become proficient with the tools and techniques (listed below) used in Combinatorics and Graph Theory, and be able to identify which techniques are most useful for a given problem:
    - Counting principles: addition, subtraction, multiplication, and division principles; Venn diagrams, Principle of Inclusion-Exclusion
    - Counting Combinations and Permutations
    - Pascal's Triangle and the Binomial Theorem
    - Proof techniques in Combinatorics: induction, counting in two ways, proof by contradiction, and the Pigeon-Hole Principle
    - Recurrence relations and generating functions
    - Graph Theory Basics: graphs, trees, complete graphs, bipartite graphs, paths, and cycles
3. Learn how to effectively communicate mathematics both verbally and in writing
    - Be able to summarize independent readings in class presentations
    - Be able to present complete and clear mathematical solutions to problems in writing.

Assessment

Assignments

There will be bi-weekly homework assignments. These assignments assess your ability to use the material that we learned in class to solve problems. You are encouraged to work on the problems together with your peers, so long as you submit your solutions independently. You will be graded on the mathematical correctness of your work and on the coherence of your explanations.

Class Participation and Presentations

Before every class, you will be assigned some readings from our textbook. At the start of each class, one of us (we'll take turns) will give an overview of the topics covered in the pre-class readings, and we will discuss and build on the content. The class presentations, along with your engagement during class will contribute towards this portion of the grade.

Tests and Exams

There will be two midterm tests during class and one final exam. The tentative dates for the midterms are:

- Midterm 1: Wednesday, February 4, 2025
- Midterm 2: Wednesday, March 18, 2025

It is your responsibility to ensure that you are in class during the dates of the test. **If you miss a test for whatever reason, please e-mail me ASAP.** If you miss the test for a valid reason, the weight of the midterm will be transferred to the final exam. You will be required to provide adequate documentation detailing the reason for your absence and inability to take the test (doctor's note, etc.). Without adequate documentation, you will likely receive a grade of 0 for that test.

Grading Scheme

Your final numerical grade will be determined by the following categories:

- 20% Assignments
- 30% Class Participation and Presentations
- 15% Midterm 1
- 15% Midterm 2
- 20% Final Exam

Resources

Office Hours

Please come to my office hours! Do you want to say hello? Do you have a question about the course—even the tiniest thing? If there is anything that you are struggling with in our class or on the homework, that's what I'm here for. I'd love for you to come by. There is no such thing as a bad question. I will try to do my best to help you! You are also encouraged to work on the assignments during office hours, and just ask questions as they arise! Tentatively, office hours are scheduled for:

- Mondays from 2:30pm to 4:30pm (in OR 1035)
- Wednesdays from 2:30pm to 4:30pm (in OR 1035)

If you cannot make any of the above times for whatever reason, send me an e-mail and we can try to find another time to talk.

How to Succeed in Math 3373

Make Sure You Do The Pre-Class Readings

Our entire class discussion, together with the problems that we work on, will be based on the pre-class readings. It is very important that you do these before class. It is okay to be confused and to have questions, as this will be a valuable contribution to our class discussion.

Come to Class Ready to Work

Mathematics is best learned by actively working through problem—something we will spend a lot of classtime doing. Coming to class ready to engage with the material will ensure that you get the most out of it.

Don't be Afraid to Make Mistakes

Making mistakes is the most important part of doing mathematics! It is an integral part of the learning process. Never hesitate to share your reasoning (even if you think it's incorrect)—we cannot arrive at a correct answer if we don't understand why the incorrect ones don't work.

Work Together and Come To Office Hours

Working with your peers in class and on homework assignments can be very helpful. Two brains are better than one and having multiple perspectives when tackling a problem provides additional insight for it. Also, come to office hours—if I understand what you are having difficulties with, I can try to help make the course better.