Applied Combinatorics

Last Updated: Mon, 12/15/2025

Course prefix: MATH

Course number: 3012

Section: A

CRN (you may add up to five):
31314

Instructor First Name: Kalila

Instructor Last Name: Lehmann

Semester: Spring

Academic year: 2026

Course description:

This course covers elementary combinatorial techniques and proof methods used in discrete problem solving.

Course learning outcomes:

This semester, we'll learn a lot of specific knowledge and tools. But we have some overall goals to work towards- by the end of the semester, we hope you'll be able to:

- **Apply** basic counting techniques, and combine them to solve more complex problems
- **Prove** statements at the appropriate level using the principles of induction, inclusion/exclusion, and other combinatorial methods
- **Solve problems** at an appropriate level using recurrence relations, generating functions, and tools and ideas from graph theory
- In the above areas, **communicate and document**your mathematical reasoning and process effectively

Required course materials:

There is no required textbook for this course; the posted notes will be your primary reference. Some helpful supplementary resources are listed below: Grimaldi is relatively inexpensive to obtain (and used copies should be affordable) and the others are free.

- *Discrete and Combinatorial Mathematics: An Applied Introduction* (5^{th} Edition), by Ralph P. Grimaldi, ISBN 0-201-72634-3
- *Applied Combinatorics* by Mitchel T. Keller and William T. Trotter (https://www.appliedcombinatorics.org/appcomb/get-the-book/)

- *Discrete Mathematics: An Open Introduction* (3rd Edition), by Oscar Levin (Discrete Mathematics - An Open Introduction (openmathbooks.org))

Grading policy:

Your final grade will be computed as follows:

Active Engagement (Homework and attendance- see attendance policy): 25%

Midterm and final exams (see below): 75%

To afford you the opportunity to recover from a poor midterm or de-emphasize the final exam based on excellent performance throughout the semester, your exam grades will be calculated using whichever of the following systems yields the higher grade:

(1) Each of three midterms worth 15%, Final Exam worth 30%

(2) Each of three midterms worth 20%, Final Exam worth 15%.

Attendance policy:

- Attendance: Studies and anecdotal experience alike suggest that regular attendance is extremely advantageous to your success in your courses (data available on request). To recognize your dedication and provide you with some accountability, attendance will be taken each day via in-class polling using Canvas quizzes. However, we realize that regular attendance is less advantageous for some students than others, and you may not wish your grade to be dependent on your presence in class. Thus you have two options:
    - If you **opt in** to mandatory attendance, it will be worth 5% of your grade (and homework worth 20%). Of course everyone has legitimate reasons for imperfect attendance, and you are allowed up to 3 unexcused absences with full credit. That is, there are 23 non-exam days after the first week, and you will be graded out of 20 days (with a maximum grade of 100%).
    - If you **opt out** of mandatory attendance, you can still attend and participate as often as you're able, but this will not count toward your grade. In this case, your homework will be worth the full 25% of your Active Engagement grade.

Academic honesty/integrity statement:

Students are expected to maintain the highest standards of academic integrity. All work submitted must be original and properly cited. Plagiarism, cheating, or any form of

academic dishonesty will result in immediate consequences as outlined in the university's academic integrity policy.