

MATH 341 Introduction to Discrete Mathematics

Introduction to ideas and methods of discrete mathematics and their application.

Pre-reqs: One of MATH 220, MATH 223, MATH 226, CPSC 121.

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Text

We will loosely follow Discrete Mathematics - Elementary and Beyond by Lovász, Pelikán, and Vesztergombi. This book can be freely downloaded from Springer via the UBC library. Physical copies can also be purchased at the UBC book store. We will also use the secondary texts Combinatorics : topics, techniques, algorithms by Cameron, which is on reserve at the UBC library, and the book Generatingfunctionology by Wilf, which can be freely downloaded here.

Course Description

This course will introduce students to many of the structures in discrete mathematics and common approaches used to study them. This is a proof based course, with emphasis on both theory and applications. Course material for the first half will mostly be taken from the text Discrete Mathematics - Elementary and Beyond .

Grading policy

The course grade will be based on biweekly homework assignments (20%), two midterms (30%), and a final exam (50%).

There will be biweekly homework assignments, which are due Thursday at the beginning of class. The lowest homework score will be dropped.

There will be two in-class midterms. Please make sure you do not make travel plans, work plans, etc., without regard to the examination schedule in this class. There will be no make-up or alternate exams. If you miss a midterm, your score will be recorded as 0, unless you have a serious documented reason (an illness, a death in the family, etc.), in which case you should discuss your circumstances with the instructor as soon as possible, and in advance of the test.

Course outline (Plan)

- * sets, power sets
- * binomial coefficients, binomial theorem
- * lattice model of a gas, entropy, growth rate of $n!$
- * Stirling's approximation, Pascal's triangle
- * inclusion-exclusion principle
- * derangements, permutations
- * permutations cont'd: two-line and cycle notation, groups
- * permutations cont'd: decomposition into disjoint cycles
- * permutations cont'd: transposition, sign of a permutation

- * Recurrence relations and generating functions, Fibonacci numbers
- * Generating functions cont'd, Stirling numbers
- * linear recurrences, Catalan numbers
- * Catalan numbers cont'd
- * Equivalence relations, partition function
- * Conjugacy classes of S_n , cycle structure
- * Euler's Pentagonal number theorem
- * Recurrence relation for the partition function
- * Young tableau, hook-length formula
- * Extremal set theory, Erdős-Ko-Rado theorem
- * Erdős-Ko-Rado theorem cont'd, Sperner's theorem
- * Sperner's theorem cont'd, SDRs, Hall's marriage theorem
- * deBruijn-Erdős theorem

Academic Misconduct:

1. UBC takes cheating incidents very seriously. After due investigation, students found guilty of cheating on tests and examinations are usually given a final grade of 0 in the course and suspended from UBC for one year.
2. While students are encouraged to study together, they should be aware that blatant copying of another student's work is a serious breach of academic integrity. Please discuss with your instructors their expectations for acceptable collaboration on any assigned coursework. Cases of suspected cheating will be investigated thoroughly.
3. Note that academic misconduct includes misrepresenting a medical excuse or other personal situation for the purposes of postponing an examination or quiz or otherwise obtaining an academic concession.

Statement on UBC's Policies and Resources to Support Student Success:

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious and cultural observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to 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>