

Description

Introduction to formal methods for reasoning and to mathematical techniques basic to computer science. Topics include propositional logic, discrete mathematics, and linear algebra. Emphasis on applications to computer science: recurrences, sorting, graph traversal, Gaussian elimination.

Expectations

You are expected to

- attend all lectures,
- solve four problem sets,
- solve four quizzes, and
- solve one course exam.

Outline

Outlined below is the course's subject matter, organized by week, each subtitled per to the context in which its topics are introduced.

Week 1 Methods of Proof & Relations

- Notation, sets, methods of proof
- Proof by induction, functions
- Ordered pairs, relations, equivalences

Week 2 Combinatorics & Asymptotics

- Combinatorics, permutations, adjacency matrix
- Binomials, inclusion-exclusion
- Estimates, asymptotics

Week 3 Graphs

- Graphs, isomorphisms, linear transformations
- Graph scores, Euler graphs
- Directed graphs, connectivity

Week 4 Trees & Probability

- Trees, isomorphisms, spanning trees
- Minimum spanning trees, determinants
- Finite probability space, expectations, indicator functions

Week 5 Conditional Probability & Graph Applications

- Bayes' theorem, Turan's theorem, Cayley's theorem

Grades

Whether taking the course Credit/D/Fail or for a letter grade, you must ordinarily submit all problem sets, quizzes, and course exam unless granted an exception in writing by the course's heads. Multiple missing problem sets, a missing quiz or exam score, and violations of the academic honesty policy may each result in a reduced or failing grade.

Final grades are determined using the following weights:

Attendance and Participation	14%
Quizzes	24%
Final Exam	30%
Problem Sets	32%

At the end of the course, one day of attendance and one quiz will be dropped from your grade. For problem sets, we will replace your lowest problem set score by the average of ALL problem set scores.

Required Course Materials

The text we will use for this course is:

- *An Invitation to Discrete Mathematics, 2nd Edition* (Jiri Matousek and Jaroslav Nesetril)
 - We will cover Chapters 1, 3, 4, 5, 8, and 10!

An additional reference made available by the department is Aspnes' canonical course notes:

- <http://cs.yale.edu/homes/aspnes/classes/202/notes.pdf>

Late Submission Policy

To allow for the exigencies of computer failures and personal crises, each student has 2 discretionary late days for homework assignments. It is acceptable to use both late days for a single assignment, turning it in up to 2 days late. These late days can be used for any reason and there is no need to get a Dean's excuse or special permission to use them. If you do have a Dean's excuse, it will be honored and we still encourage you to talk to your Dean if you have a serious incapacitating issue, but we hope that the flexibility of this policy will reduce the overall need for Dean's excuses.

If both late days have been used, assignments may still be submitted up to 2 days late, but they will incur a 10% late penalty per day (5 minutes after the deadline is still considered 1 day late).

Academic Honesty Policy

The homework assignments in this course are intended to give you practice at working through problems independently. Therefore, unless otherwise specified, the homework assignments are your individual responsibility and are not group assignments.

Plagiarism is a violation of University rules and will not be tolerated. You must neither copy work from others (at Yale or elsewhere) nor allow your own work to be copied. In addition to grade penalties, [additional consequences](#)

[Links to an external site.](#)

for breaking this policy may be imposed by the Yale College Executive Committee.

You may:

- Ask others or search online for help with high-level course concepts that are not specific to the assignment.
- Ask clarifying questions about the requirements of an assignment to TAs or on the course discussion board.
- Discuss more specific issues on an assignment with a TA or instructor.
- Query for basic mathematics identities and computations via software like WolframAlpha.

You may not:

- Discuss your individual solution with your peers.
- Receive a printed or electronic copy of anyone else's work for the course from this term or any other term.

- Give anyone else a printed or electronic copy of your work for the course for this term or any other term. This includes posting your work publicly on sites such as Github.
- Seek out solutions to similar assignments online.
- Query for proofs to aid in problem sets or similar assignments via software like ChatGPT.

If you have any questions about this policy or are unsure if you may have crossed a line, discuss it with the instructor as soon as possible.