Syllabus: INFO 150

Prof. Peter J. Haas
Spring 2026

Overview:

INFO 150 is a 3-credit introductory undergraduate course in discrete mathematics and the mathematical method. It has been developed for use in the Informatics degree program in the Manning College of Information and Computer Sciences, which focuses on the application of computational principles and techniques to advance other disciplines. For informatics majors, we want to cover a lot of the topics covered in the computer science courses CMPSCI 250 ((logic, number theory, induction proofs, graphs and graph algorithms, and finite-state machines) and CMPSCI 240 (counting, probability, and various kinds of probabilistic reasoning) in a single course; we want to do this in a way that is accessible *without programming and without calculus*. Our goal is to prepare you for the mathematical thinking in later courses. We also hope that this course will help you with the precise thinking and the clear exposition of ideas you will need in programming.

Course Prerequisites:

The material of the course does not overlap much with that of the conventional pre-calculus and calculus courses, but it will demand some basic skill in calculation and algebra. There are no formal prerequisites except for R1 basic math. Many of you will have taken some of the relevant intro courses. But if you have taken all of them, such as both CICS 160 and MATH 132, you *probably don't belong here* because you are ready for COMPSCI 240 and 250.

Course Goals:

The primary goal is to teach you to think mathematically and, importantly, to communicate your thinking to others using mathematical language. The emphasis is on the type of computational thinking needed to build and analyze systems for solving problems in real-world domains such as healthcare, biology, social and political sciences, business, and more.

Course Objectives:

After completing the course, you will be able to

- Use recursive thinking and pattern identification to analyze complex problems, games, puzzles, numerical sequences, algorithms, and more.
- Use the tools of mathematical logic—truth tables, predicates, implications—to reason about the world in a precise manner, to analyze arguments, to solve puzzles, and to better understand computer programming languages
- Communicate via fluent mathematical writing, and be able to both read and write direct, contrapositive, and inductive mathematical proofs.
- Apply your reasoning and proof skills to analyze properties of numbers, sequences, and other mathematical objects.
- Understand, analyze, and manipulate functions, relations, and sets, and connect these to the practical concepts of computer programs and data.
- Apply the tools of combinatorics to count the number of objects that satisfy some specified set of conditions.
- Understand and apply the basic rules of discrete probability to compute probabilities in situations characterized by uncertainty.
- Perform basic operations on—and analyze properties of—graphs, with application to puzzles, games, pathfinding problems, and social network models.

Logistics:

Instructor: Peter J. Haas (phaas@cs.umass.edu) Note: There is another Prof. Peter Haas (Peter M. Haas) on campus, in Political Science. Please make sure to send emails to the correct Prof. Haas (Peter J. Haas).

Credits: 3

Time and Location: Monday/Wednesday 4pm-5:15pm in LGRC Tower Room 123. Lectures will be recorded on Echo360 and available online, typically within 24 hours. There will usually be some in-class activities.

Office Hours: Tuesday and Thursday 4:00pm-5:00pm in CS 204

TA: Allison Poh (apoh@umass.edu), Office hours TBD

UCA: Adithi Sharan (asharan@umass.edu)

Required Textbook: The required textbook is Ensley and Crawley, *Discrete Mathematics*. It's pretty expensive, but there is the cheaper options of renting it or buying it used. (I didn't see options of renting it or getting the e-book on the Amazon site, but they may exist). Do not buy the paperback "solutions manual" in place of the hardcover textbook. We'll work through most of the book, with specific sections as specified on the syllabus.

It will supplement the lectures with additional examples and in-depth coverage of the topics, as well as homework problems and optional material that we will not have time to cover in class. A (physical) copy of the textbook is at UMass Libraries course reserves: Students can bring the call number (QA9.25.E57 2006) to the Learning Commons desk on the lower level of the Du Bois Library to check it out for 4 hours at a time. The first chapter of the textbook is available digitally from UMass Library reserves (accessed via Canvas) to help smooth things out at the start of the term.

Optional Online Textbooks: A couple of useful (optional) open-source books are available as well. Kwong, *A Spiral Notebook of Discrete Mathematics* is available online; Reading Chapters 0 and 1 is highly recommended as a way to both brush up your algebra and other basic skills, and hone your study habits. Levin, *Discrete Mathematics: An Open Introduction* is an online interactive textbook and is a good source of practice problems.

Turning in Assignments: We will be using Gradescope for grading homeworks and exams. When turning in assignments, you will need to upload them to Gradescope as a pdf file; ask one of the teaching team or go to the Gradescope help page. Please make sure to label all problems clearly and use a separate page for each problem. Assignments are generally be submitted by 11:59pm on the day that they are due (usually Friday). See below for policies on late homework. *It is a very bad idea to wait until the last minute to upload, since a computer or internet glitch can cause your assignment to be late; try to submit at least 30 minutes before the deadline.*

Online discussion forum: We will use Piazza. See the "Course Policies and Expectations" section for Piazza do's and don'ts.

Course Policies and Expectations:

Grading: Your grade in INFO 150 will be based on the following:

- **Quizzes** (20%): There will be a weekly quiz, with due dates as on the schedule. The first quiz will be posted the first day of class and then each quiz will be posted on Canvas after the previous quiz closes. These are very short quizzes (~15-30 minutes) to make sure that you are following the material and to give you additional practice. The quiz should be pretty straightforward if you have attended the lecture. We will drop your lowest quiz score when computing your course grade.
- **Homework** (20%): These will usually be assigned on Friday, and due on Gradescope the following Friday by 11:59pm Amherst Time. We will drop your lowest homework when computing your course grade.

- **Exams** (60%)**:** There will be three non-cumulative exams whose goal is to help you synthesize what you have learned. Each will count for 18% of the course grade, and the remaining 6% will be your best exam score (an "exam bonus"). You will have up to two hours for an exam that should be doable in one hour. We will make up a practice exam, similar in length and difficulty to the real exam, and post it a week before the real exam. We'll then post solutions to the practice exam with a few days to go. The first two exams will each be held in class (with extra time added) on February 25 and April 8. The final exam will take place during the final exam period on Monday, May 4 from 6-8pm. It will be cumulative, but emphasize the material in Lectures 17-24.

  Tentative grading scale (all numbers are percentages):

A	92.5-100	C+	77.5-80	F	Below 60
A-	90-92.5	C	72.5-77.5		
B+	87.5-90	C-	70-72.5		
B	82.5-87.5	D+	65-70		
B-	80-82.5	D	60-65		

  Note: I recognize that this is a diverse class in terms of experience and mathematical ability, and the grading will try to compensate for this. To some extent my expectations as to the amount and difficulty of what you can do may evolve over the term. Anyone I judge minimally able to go on in this area will get at least a C and anyone who fulfills all my reasonable expectations for a student at your level will get an A.

Important note: Our goal is to give you a high-quality learning experience and engage your interest in the beauty of discrete mathematics. To this end, the instructor reserves the right to modify course structure and policies as needed in order to adapt to changing or unforeseen circumstances.

Attendance policy: Attendance at all class meetings is expected but not enforced by grading penalties. Live attendance gives you a chance to ask questions (in a way that will benefit all students), it helps you network with other students to find study partners, and it lets you participate in the in-class activities, which gives you valuable practice. In the past, I have seen a strong link between regular attendance and a good course grade; studies have confirmed that in-class participation is much more effective in helping you learn than viewing online materials such as Echo 360 recordings. In-class attendance has also been shown to be good for your general mental health, to avoid feelings of isolation. Students who cannot attend class are responsible for any material covered during their absence. Late

arrivals must enter the classroom quietly and discreetly. Annotated slides for each course unit (which may span several lectures) will be made available after completion of the unit.

Missing an exam: With a doctor's note and/or legal documents that comply with the University's Class Absence Policy, you will be able to take a make-up quiz/final and/or miss more than three classes.

Ground rules for Piazza: You must converse respectfully with each other and with the instructors.

- Posts are restricted to topics directly related to the class.
- You may post anonymously (to other students but not to staff), but do not abuse this privilege
- You may ask for hints or clarifications, but do not simply ask for answers to the questions or post such answers.
- You are encouraged to help other students via posting (subject to the above restrictions).
- For private matters you are encouraged to post privately to teaching staff or, if needed, to email Prof. Haas. We strongly recommend that you post privately on Piazza rather than emailing the instructor or a TA, so that anyone on the teaching staff can respond to your post; this will shorten the response time.

Late homework policy: There will be ten homework assignments, to be handed in on Gradescope. They are due at 11:59 PM on Fridays, with a late day available on the following Saturday (up to 11:59pm). If you hand in your assignment during Saturday, you will get a 20% penalty to your grade with the following exceptions:

- Students registered with Disabilities Services may use the late day with no penalty.
- If you have special circumstances, you may apply for a waiver of the late penalty.
- The best of your late homeworks (if you have any) will not be charged a penalty. We'll compute this at the end of the term.

Homework and exam regrading policy: You must contact the TAs with grading questions *within 5 days* of when the homework or exam is returned.

Welcoming classroom environment: In both synchronous and asynchronous environments you are expected to uphold and promote a welcoming environment for learning. Politeness and tolerance are expected at all times; avoid denigrating phrases like "that's so obvious" or "that's dumb".. You need to respect others having different academic backgrounds and skills. This is especially true in INFO 150, where people's preparation and interests vary widely. You may be doing better at logic than someone else, but they may know a lot more about bioinformatics than you do. Similarly, we will not tolerate disrespect

for anyone based on their gender, race, ethnicity, or sexual orientation; try and be aware of your own biases and avoid microagressions. (E.g., if there is a woman in your group don't automatically assume that she will be the scribe.) Listen to others and let them participate; ask yourself whether you are dominating a conversation and not giving others a chance to contribute. We are hoping that your generation will help correct the longstanding inequities in the field of computer science: Good habits start now!

Academic honesty policy: The Association of Computing Machinery (ACM), the world's largest professional computing society, recently released an updated Code of Ethics, and with good reason. Given the dominant role of computer technology in our society, ethical lapses can have disastrous consequences. Ethical behavior begins here at UMass. The following discussion pertains to academic honesty from the perspective of this course.

- Exams are closed book and no outside help is allowed. **Any** cheating on an exam is grounds for an F in the course.
- You may work together on homework, but what you hand in must be yours in presentation. If it is identical to another's work, there's a problem. A good practice is to divide your work into an "ideas phase" where you collaborate and a "writeup phase" where you work alone -- enter the writeup phase with notes, but not written solutions.
- You must always *acknowledge your sources*, whether they are people you worked with or web pages you consulted. Of course, simply copying a solution to a problem from the web is cheating.
- As per MCICS policy (and US copyright law), no student shall post course materials online without explicit permission of the instructor. Nor shall a student provide course materials to a third party such as Chegg or CourseHero. See the copyright section below for further details.
- Writing your answers using an AI tool *is not allowed*! (They are not very good at this yet.
- For the quizzes, anything goes.

For more information about what constitutes academic dishonesty, please see the Dean of Students' website for the general UMass academic honesty policy. Since students are expected to be familiar with this policy and the commonly accepted standards of academic integrity, ignorance of such standards is not normally sufficient evidence of lack of intent. You can take a quick online quiz to check your "academic integrity quotient (AIQ)".

Student Conduct: We are committed to fostering a culture where everyone is treated with dignity and respect. This course is for everyone. This course is for you, regardless of your age, background, citizenship, disability, education, ethnicity, family status, gender identity, geographical origin, language, military experience, political views, race, religion, sexual orientation, socioeconomic status, or work experience. We bring different skills to the

course, and we will all be learning from and with each other. We respect everyone's right to be addressed by the name and pronouns that they choose. You can indicate your preferred/chosen first name and pronouns on SPIRE, which appear on class rosters. A student's chosen name and pronouns are to be respected at all times in the classroom.

In both live and online settings, we all are expected to uphold and promote a welcoming environment for learning. Politeness, kindness, and tolerance are always expected. Respect that people have differences of opinion, and work and approach problems differently. Please keep unstructured critique to a minimum and make sure that any criticism is constructive. Try and be aware of your own biases and avoid micro-aggressions. Listen to others and let them participate; ask yourself whether you are dominating a conversation and not giving others a chance to contribute. Disruptive behavior is not welcome, and insulting, demeaning, or harassing anyone is unacceptable. We follow the university's guidelines for classroom civility. In particular, we don't tolerate behavior that excludes people in socially marginalized groups. If you feel you have been or are being harassed or made uncomfortable by someone in this class, please contact a member of the course staff immediately, or if you feel uncomfortable doing so, contact the Dean of Students office.

University policies on student conduct, including classroom civility, can be found at

https://www.umass.edu/dean-students/student-conduct/code-of-conduct

Copyright: Lectures and course materials, including slides, videos, assignments, tests, outlines and similar materials, and all course recordings, are protected by U.S. copyright laws and by university policy. The instructor is the exclusive owner of the copyright in materials they create. Students may take notes and make copies of course materials for your own use in this class. They may also share those materials with another student who is registered and enrolled in this course. They may not reproduce, distribute, upload, or display any lecture notes or recordings or course materials in any other way — whether or not a fee is charged — without my express written consent. If you do so, you may be subject to disciplinary action under the UMass Code of Student Conduct. Similarly, students own the copyright to your original papers and exam essays. If the instructor is interested in posting a student's answers or papers on the course web site, they will ask the student for their written permission.

Accommodation Statement: The University of Massachusetts Amherst is committed to providing an equal educational opportunity for all students. If you have a documented physical, psychological, or learning disability on file with Disability Services (DS), you may be eligible for reasonable academic accommodations to help you succeed in this course. If you have a documented disability that requires an accommodation, please notify me within the first two weeks of the semester so that we may make appropriate arrangements. For further information, please visit Disability Services (https://www.umass.edu/disability/).

Title IX statement: In accordance with Title IX of the Education Amendments of 1972 that prohibits gender-based discrimination in educational settings that receive federal funds, the University of Massachusetts Amherst is committed to providing a safe learning environment for all students, free from all forms of discrimination, including sexual assault, sexual harassment, domestic violence, dating violence, stalking, and retaliation. This includes interactions in person or online through digital platforms and social media. Title IX also protects against discrimination on the basis of pregnancy, childbirth, false pregnancy, miscarriage, abortion, or related conditions, including recovery. There are resources here on campus to support you. A summary of the available Title IX resources (confidential and non-confidential) can be found at the following link: https://www.umass.edu/titleix/resources. You do not need to make a formal report to access them. If you need immediate support, you are not alone. Free and confidential support is available 24 hours a day / 7 days a week / 365 days a year at the SASA Hotline 413-545-0800.

Learning Support: Along with the staff and the textbooks, there are additional support resources for the course.

The Learning Resource Center
The Assistive Technology Center
Disability Services
Student Success
Center for Counseling and Psychological Health
English as a Second Language (ESL) Program
CMASS Success Coach Program
Single Stop Resources

Schedule

Reading assignments are from Ensley and Crawley: "Discrete Mathematics: Mathematical Reasoning and Proof with Puzzles, Patterns, and Games". We strongly recommend that you look through Chapters 0 and 1 in the online Kwong book during the first week.

PART I: Mathematical Problems, Language, and Proofs

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Mon 02 Feb L01 Course Overview and First Examples (1.1)
Wed 04 Feb L02 Number Puzzles and Sequences (1.2)
               (END OF ADD/DROP)
Mon 09 Feb L03 Truth-tellers, Liars, and Propositional Logic (1.3)
Wed 11 Feb L04 Predicates, Quantifiers, Translations (1.4)
Fri 13 Feb H01 Homework #1 Assignment Due at 11:59 pm
Mon 16 Feb --- (PRESIDENTS DAY HOLIDAY)
Tue 17 Feb Q01 Quiz #1 due on Canvas
Wed 18 Feb L05 Implications (1.5)
Thu 19 Feb L06 Mathematical Writing (2.1)(MONDAY SCHEDULE FOLLOWED)
Fri 20 Feb H02 Homework #2 Assignment Due at 11:59 pm
Mon 23 Feb L07 Proofs About Numbers (2.2)
Tue 24 Feb Q02 Quiz #2 due on Canvas
Wed 25 Feb X01 FIRST MIDTERM (4-6 pm, LGRC 123) on Lectures 1-7
               (Chapters 1, 2.1-2.2)
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PART II: Induction, Sets, Relations, and Functions

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Mon 02 Mar L08 Mathematical Induction (2.3)
Tue 03 Mar Q03 Quiz #3 due on Canvas
Wed 04 Mar L09 More Induction (2.3, 2.4)
Fri 06 Mar H03 Homework #3 Assignment Due at 11:59 pm
Mon 09 Mar L10 Sums (2.4), Induction to Prove Correctness (extra)
Wed 11 Mar L11 Set Definitions and Operations (3.1)
Thu 12 Mar Q04 Quiz #4 due on Canvas
Fri 13 Mar H04 Homework #4 Assignment Due at 11:59 pm

(SPRING RECESS)

Mon 23 Mar L12 More Operations, Properties of Sets (3.2, 3.3)
Wed 25 Mar L13 Functions One-to-One, Onto, and Composition (4.1, 4.2)
Thu 27 Mar Q05 Quiz #5 due on Canvas
Fri 27 Mar H05 Homework #5 Assignment Due at 11:59 pm
Mon 30 Mar L14 Relations and Equivalence Relations (4.4, 4.5)
Wed 01 Apr L15 Combinatorics, Basic Rules for Counting (5.1, 5.2)
Thu 02 Apr Q06 Quiz #6 due on Canvas
Thu 02 Apr --- (LAST DAY TO DROP WITH W OR ELECT PASS/FAIL)
Fri 03 Apr H06 Homework #6 Assignment Due at 11:59 pm
Mon 06 Apr L16 Combinations, Binomial Thm, Counting Seq. (5.3, 5.4)
Wed 08 Apr X02 SECOND MIDTERM (4-6 pm, LGRC 123) on Lectures 8-16
               (Chapters 2.3-2.4, 3, 4, 5)
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PART III: Counting, Probability, and Graphs

Mon 13 Apr L17 Probability, Sum and Product Rules (6.1, 6.2)
Tue 14 Apr Q07 Quiz #7 due on Canvas
Wed 15 Apr L18 Probability in Games of Chance (6.3)
Fri 17 Apr H07 Homework #7 Assignment Due at 11:59 pm
Mon 20 Apr --- (PATRIOT'S DAY)
Wed 22 Apr L19 Expected Value, Variance, Normal Dst'n (6.3, extra)
Thu 23 Apr Q08 Quiz #8 due on Canvas
Fri 24 Apr L20 Expected Value in Games (6.4)(MONDAY SCHEDULE FOLLOWED)
Fri 24 Apr H08 Homework #8 Assignment Due at 11:59 pm
Mon 27 Apr L21 Expected Value Using Recursion (6.5)
Tue 28 Apr Q09 Quiz #9 due on Canvas
Wed 29 Apr L22 Bayes' Theorem and Inference (not in book)
Fri 01 May H09 Homework #9 Assignment Due at 11:59 pm
Mon 04 May L23 Graphs and Trees (7.1, 7.2)
Tue 05 May Q10 Quiz #10 due on Canvas
Wed 06 May L24 Paths and Matrices (7.4, adapted)
Fri 08 May H10 Homework #10 Assignment Due at 11:59 pm

Final Exam (cumulative) Mon 11 May 6-8pm, LGRT 123