MATH/CMSC H395 INTRODUCTION TO DISCRETE MATH
FALL 2026 COURSE SYLLABUS

Instructor: Chris Wells

Class meetings: Mondays and Wednesdays 1:00–2:25pm. Class meetings will be a mixture of active learning exercises in groups and lecture on new material.

Student office hours: Listed on the course website.

Course Textbook: There is no official course textbook.

Course Prerequisites: Solid understanding of calculus and pre-calculus. Furthermore, this should **not** be your first proofs-based course.

Course Description: This course introduces three fundamental aspects of discrete mathematics: enumeration, graph theory and discrete probability. Our introduction to enumeration covers basic counting, basic approximations, bijective arguments, double-counting arguments, recurrence relations, generating functions, the pigeonhole principle, inclusion-exclusion, etc. Our introduction to graph theory includes topics such as connectivity, trees, matchings, colorings, Ramsey theory, etc. Our introduction to discrete probability includes linearity of expectation, the law of averages, Markov's inequality, Chebyshev's inequality, etc. We will see how discrete probability can be used to prove the existence of surprising discrete structures.

Growth, not ability: There is a prevalent belief that you are either "good" or "bad" at math, and if you are "bad" at it, then you will always be bad at it no matter how hard you try. **This is totally false, and the mathematics community bears a lot of responsibility for perpetuating this myth**. In reality, mathematics is just like any other discipline or skill: you can improve more and more with practice.

All of us are all capable of growth in mathematics. You should measure your success in this class by how much your understanding of the concepts has improved over the course of the semester. Also, math can be very hard, so you should expect to struggle with the material! When you struggle, you are learning and growing. If you find that you are not struggling at all, this might not be the right course for you and you should consider a more advanced course.

Course Structure: Classes will be held in an interactive lecture format with space for questions, conversation, and small group work on worksheets. While it can feel awkward at first, we expect students to ASK LOTS OF QUESTIONS during class. THERE ARE NO "stupid" questions—if you need clarification or have an idea you want to explore, there are always at least several other students with the same question. Asking questions during the class is also a good way to slow things down, if you think the new ideas are going by too fast and furious. At times, we will stop for questions and not proceed at all until we get some!

Homework: Mathematical proficiency requires practice, and a lot of it. The concepts we are going to learn aren't easy to grasp and they will require a good deal of contemplation outside of class to really understand. So, there will be a lot of homework. **Students should expect to spend at least 6-8 hours a week on outside homework assignments**. Assignments are due on the dates specified on the course calendar on the course webpage. They must be written neatly, with the names of any collaborators listed separately on the front page, and scanned and uploaded to Gradescope. **Late papers will generally not**

be accepted for grading, but EVERY student can miss one written assignment without penalty (if none are missed, the lowest score will be dropped).

Keep in mind that the point of mathematical proof is not only to convince oneself that something is true, *but also to communicate that truth effectively to one another!* This can not be stressed enough. Mathematics is a social activity, practiced by human beings working together to understand our world and our universe. That means that an important component of proof-writing is learning how to write in a way that is clear, concise, and inviting! Just like writing an essay in a history, English, or philosophy course, there is a certain "style" that goes along with writing good mathematical proofs.

The homework grading scheme reflects the fact that this is in some sense a writing course in as much as it is a course in abstract mathematical concepts. Most homework problem will be graded out of 4 points. Here is a basic rubric:

4 points: A complete and correct solution with no logical gaps, and clear/concise exposition.
3 points: A complete and correct solution with no logical gaps, but the exposition needs work OR a good attempt with clear exposition that would be fully logically correct if some minor details were fixed.
2 points: A good attempt with clear exposition but with a significant logical gap or error in the argument OR a good attempt with some minor logical issues AND the exposition needs work.
1 point : The beginnings of some ideas are present.
0 points: No serious attempt at a solution has been made.

Course policies and recommendations for homework:

- **Professors in the Math/Stats department strongly encourage students to work together on written homework assignments**—unless announced otherwise. Collaboration is an incredibly important aspect of mathematical science and so you should think of the homework assignments as an opportunity to practice the skill of working well with others. On the other hand, it is very easy to "trick" yourself into thinking you understand something when working with a group of peers who come to an answer collectively. So, **be sure that you are writing up your own solutions and that you understand the ins and outs of each problem**. To do this, you should first think about the problems on your own, get a grasp of what they're asking and how they might be approached, and then meet up with your collaborators to work together from there. **If you do work in a group for the homeworks, you must turn in your own assignment, written in your own words. You must also mention who you worked with on your assignment so that the graders can keep track of who worked with whom.**
- **Generative Artificial Intelligence (AI), Other Resources and Responsible Usage:** We assume that students and instructors share the same goals for this class: at the end of the course, to deeply understand the key ideas of discrete math and how to explain them in the language of mathematics (definitions, theorems, proof) as well as how to perform associated calculations. We also want students to begin to appreciate the logical structure of mathematics—how theory is built up, step-by-step, introducing new concepts and definitions and theorems that depend on previous concepts, definitions and theorems. We think that using tools like generative AI to solve homework/exam problems, or internet searches for answers to homework/exam problems runs counter to these pedagogical goals—getting ANSWERS without increasing LEARNING.

  As a consequence, we **prohibit the use of outside resources (AI, internet searches, other textbooks) to find ANSWERS to assigned course problems/exams.** Using any of these to get a better understanding of CONCEPTS is OK, but risky, since there are many ways to teach and learn discrete math concepts, and resources other than the two course textbooks may use different approaches to the same ideas. **If your submitted work shows evidence of using other than the approved course resources, that will be considered a potential violation of the honor code.**
- **Respecting each other**: We are not all coming to this class with the same privileges, resources, time, and knowledge. It's really important to keep this in mind when working with each other

on homework assignments and during lecture. **It is our strong belief that as a community, mathematicians and scientists need to do a much better job of making our disciplines more accessible to people of all races, genders (including gender non-conforming folks), sexual identities, and class backgrounds**. While this is a priority for your instructors in the classroom, we do not claim to know how to best honor this commitment, and so **we are very open to feedback from students when it comes to making the course more accessible and inclusive to all identities**.

- **MID and SIMPLE:** To help us all be aware of these issues, there are two student-run groups called *Mathematics Inclusion and Diversity* (MID) and the SIMPLE group (this is a mathematical pun). In the past, MID members have conducted some short seminars during the semester to explore how identities play out in the context of collaborative work in math courses. We will publicize any MID seminars held this semester once they are organized.

It's also important to think about how to respect one another when working together on homework assignments. It's not equally easy for all of us to speak up in a large group, and the voices of historically underrepresented/marginalized students are most easily drowned out in group work. So please keep this in mind when working together. Here are some concrete examples of positive collaborative behavior:

(1) Making sure everyone who wants it has the opportunity to speak frequently. This can mean checking in with each other to make sure everyone is following along and contributing when they have an idea.
(2) Respecting people's pronouns and other aspects of their identity.
(3) Making sure that everyone's ideas are acknowledged when writing up the final solution to a problem. When working in groups, solutions often evolve organically; an idea might pop into your head and you may think it's yours and yours alone, but perhaps you only arrived there because of something else that someone already said. Pay attention to what people are saying and try to learn from one another.

If at any time in the semester you want to be working in a group but do not have a group of students to work with, please let your instructor know and we will help you find a working group. If at any time in the semester, you find yourself in a group of students for which the above behaviors aren't being practiced and people aren't feeling respected, please let us know as well.

Grading and Exams:

There will be TWO exams: a midterm and a final. Weeks with exams won't have written homework due. The second exam will take place during the Final Exam Period. See the course schedule for dates of these exams. Here are the weights of the various course components in the final course grade calculation:

- Written Homework (lowest score dropped): 50 %
- Exams: 25 % each

Note: The instructor reserves the right to adjust these weights in a way that HELPS a students course grade, in circumstances where a student has a low grade in one or more of the assessments and shows significant improvement on the last exam. Also, you may occasionally be invited to your instructor's office for an oral explanation of your thought process and approach on a homework or exam problem—particularly when it's hard to follow an argument or proof.

Resources: Haverford College is committed to supporting the learning process for all students. Please contact your instructor as soon as possible if you are having difficulties in the course. There are also many resources on campus available to you as a student, including:

- **Student Office Hours:** Don't be shy about dropping in during the posted Student Hours with questions—no appointment needed. To make an appointment at other times, please email your instructor with your availability and we'll try to find a time that works.
- **Free Peer tutoring and time-management**: Please go to the Office of Academic Resources for further information.

Enjoyment: You should be getting a great deal of enjoyment and satisfaction from taking this challenging class, which covers so much interesting and beautiful mathematics! Please contact your instructor as soon as possible if you're not enjoying yourself, and we can discuss strategies together to improve your overall happiness and success in the course.

Additional Remarks: If you think you may need accommodations because of a disability, you should contact The office of Access and Disability Services (ADS). If you have already been approved to receive academic accommodations and would like to request accommodations in this course because of a disability, please meet with your instructor privately at the beginning of the semester (ideally within the first two weeks) with your verification letter.

Haverford College is committed to fostering a safe and inclusive living and learning environment where all can feel secure and free from harassment. All forms of sexual misconduct, including sexual assault, sexual harassment, stalking, domestic violence, and dating violence are violations of Haverford's policies, whether they occur on or off campus. Haverford faculty are committed to helping to create a safe learning environment for all students and for the College community as a whole. If you have experienced any form of gender or sex-based discrimination, harassment, or violence, know that help and support are available. Staff members are trained to support students in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, and more.

The College strongly encourages all students to report any incidents of sexual misconduct. Please be aware that all Haverford employees (other than those designated as confidential resources such as counselors, clergy, and healthcare providers) are required to report information about such discrimination and harassment to the Bi-College Title IX Coordinator

Information about the College's Sexual Misconduct policy, reporting options, and a list of campus and local resources can be found on the College's website