

COURSE SYLLABUS

MATH 3012, Applied Combinatorics, Section I, Fall 2026

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Welcome to Combinatorics! I'm excited to teach each of you this semester. This syllabus is your handbook to the course, and contains tons of useful information.

Course Description:

This course covers elementary combinatorial techniques used in discrete problem solving: counting methods, solving linear recurrences, graph and network models, related algorithms, and combinatorial designs.

Course Materials:

There is no required textbook for this course; the materials posted in Canvas 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. Please note that occasionally conventions and definitions vary between sources; it is your responsibility to ensure your understanding is consistent with the official materials.

- *Discrete and Combinatorial Mathematics: An Applied Introduction* (5th 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 \(openmathbooks.org\)](https://openmathbooks.org/discrete-mathematics/))

Goals and Expectations (What we want to do)

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

Course Components (How we plan to do it)

At any level, *we all learn math by doing math*. This course is carefully designed to help you engage with the material in increasingly challenging ways, with an increasing amount of independence. In order to get the most out of the class, you will need to be a little bit brave- let yourself try hard things (failing is an important part of learning too!), and ask questions when you have them.

The first time you encounter new material will be **in class**. We will talk about new ideas, answer any initial questions, and have a chance to try some first exercises to help you cement your new understanding and identify any sticking points.

Your **homework** will be the second time you tackle new ideas- this time without immediate assistance. Homework may be challenging, but this is your first opportunity to push yourself. We don't expect you to do it perfectly every time—you are still learning! I encourage you to think of homework as practice for exams: write every solution well as if it was worth a lot of your grade, and take the opportunity to get feedback on your best work *before* it costs valuable points. And remember—what you *practice* is what you'll automatically do on the exams!

Your **midterm and final exams** are the culmination of the hard work and good practice you've put in during class and on homework. The exams are weighted so that strong midterms can take pressure off of the final, but an excellent final can make up for midterms that cover material you needed a little longer to master.

Assessments (How we measure what we're doing)

Assessments in this course fall into two main categories: Active Engagement and Exams. The Active Engagement category evaluates your regular participation in activities that will prepare you to succeed in the course.

Active Engagement:

- Attendance: Studies and anecdotal experience alike suggest that regular attendance is extremely advantageous to your success in your courses. 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 are still encouraged to attend and participate as often as you're able, but your presence will not count toward your grade. In this case, your homework will be worth the full 25% of your Active Engagement grade.

You will be asked to submit a final decision on your attendance model by the end of the day on the second Tuesday of classes; if you fail to do so you will be assumed to have “opted in” to mandatory attendance.

In order to maintain the integrity of this scheme, changing attendance models after the deadline is not allowed. Should you experience an unexpected change in circumstances which

dramatically alters your ability to attend class, as confirmed by a note from the Dean of Students, you may make one change to your decision, which must be requested before the final exam.

- Homework: The best way to master new skills is lots of practice. Each week, you'll submit your solutions to a collection of a few focused problems, to receive graded feedback on your work. **Please remember that throughout the semester, you are expected to give complete and detailed solutions (including work) for all graded work in order to receive full credit.** You can find an example of a good quality solution and specific details in Canvas.

Weekly homework will be submitted through Gradescope (available through Canvas), and will be due at 11:59pm each Tuesday that does not directly follow an exam. All homework must be submitted as a single PDF, and should be clearly legible with the work for each problem correctly designated in Gradescope. You are encouraged to typeset your homework using LaTeX or similar software, but not required to.

All homework will be accepted up to 3 days late (i.e., until 11:59pm on Friday) with a 10% penalty per day. Students with an official excused absence from the Dean of Students or specific ODS accommodations regarding deadlines will not incur a deduction, but are bound by the same late deadline.

You are welcome (and encouraged) to collaborate with your classmates on solving homework problems, and to bring your questions to office hours or meet me before/after class for quick questions. However, remember that the point of doing homework is to develop your individual understanding of the material- thus *all solutions submitted for grading must consist entirely of your own original work*. You should refrain from obtaining answers from the internet, past semesters, generative AI, or any other source.

Between 11 or so homework assignments worth 20 points each, plus Homework 0, you will have ~223 homework points available throughout the semester. Because you are expected to make mistakes as you try things for the first time, your grade will be calculated out of 200 points (with a maximum grade of 220/200).

Due to the flexibility built into each part of the system, all missed attendance requires an official note to be excused, and no homework extensions beyond the late deadline will be granted under any circumstances. Late work beyond the late deadline will not be accepted in any case, regardless of the date on which it was completed.

Exams:

- We will have three 75-minute midterm tests during the term, which will all take place during our normal class time, on the dates listed in the course schedule.
- The final exam will be cumulative, covering all material for the semester. All students must take the final. The final exam will consist of 3 sections, one covering each third of the course.

Please note that all exam dates have been posted, and you are expected to make every effort to attend each exam. You should notify your instructors of any conflicts as soon as possible. Please also keep in mind when making travel plans that conflict periods are on the last day of finals (so if you need an

alternate final for any reason, you may need to wait until that day).

You must be physically present on the GA Tech campus to take all midterm and final exams; no virtual exams will be given under any circumstances.

No books, notes, calculators, cell phones, or other aids or electronic devices are allowed during proctored assessments, nor may you collaborate with anyone else. On all assignments, you are expected to show your work and use correct reasoning and notation in order to receive full credit.

Academic honesty dictates that all material submitted for grading consist entirely of your own original work.

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:

- Scheme 1:
 - Each of 3 Midterm Exams: 15% (45% total from Midterm Exams)
 - Final Exam: 30%
- Scheme 2:
 - Each of 3 Midterm Exams: 20% (60% total from Midterm Exams)
 - Final Exam: 15%

Grading and Absence Policies and Procedures

Your final grade will be computed as follows:

- Active Engagement: Homework, and attendance if selected: 25%
- Midterm and Final Exams, as weighted above: 75%

Letter grades will be determined based on the following standard intervals:

A: [90%, 100%], **B:** [80%, 90%), **C:** [70%, 80%), **D:** [60%, 70%), **F:** [0%, 60%).

Percentage grades are **not necessarily** rounded to the nearest integer before conversion to letter grades. For example, 89.999% is converted to a B, etc. Assignment of letter grades will be made to all students uniformly based on course grade totals. **Individual “grade increases” will not be considered; please do not submit such requests.**

Regrading of Work:

If any of your work has been graded in error, you may submit a regrade request in Gradescope within 3 days of the date the assignment was returned. You are also responsible to report any missing grades within this window.

You should check your answers with the posted solutions before submitting a regrade request, and include in your note a specific reference to points earned and not assigned. Regraded work may be adjusted to add or subtract points in order to correct any error in evaluation.

Make-Up Exams:

A make-up exam will only be offered in the event of an excused absence. Reasons for which an absence may be excused are:

- An athletic or university-sponsored event: You should provide official documentation at least one week in advance of the exam.
- An ongoing or serious medical or family emergency: You should provide official documentation as soon as you are able through the Dean of Students office (*please do not submit sensitive personal information to me directly*).
- Religious commitments: If any course responsibility coincides with a major religious holiday or commitment, please let me know at least one week in advance- we'll do our best to respect such limitations.
- Illness: We understand that there are illnesses that are serious enough to preclude your presence in the classroom, but may not quite necessitate a visit to the doctor. If you are very ill the day of an assessment, please contact me by the end of that day to discuss the possibility of a makeup.

I reserve the right to ask for documentation of any illness or absence, especially for repeated absences. Voluntary personal travel will generally not be accepted as justification for an excused absence.

All requests for a makeup exam must be initiated no later than 36 hours after exam was given. All makeup exams will be given at a common time to be announced.

Students with an excused absence from both an exam and makeup may use the grade from the corresponding portion of the final exam as the grade for that midterm, for one portion only (i.e., every student will be graded on at least 2 midterms). Dated documentation from the Dean of Students to verify both absences is required to utilize this option.

Per department policy, there will be no retakes of any assessment. Any student who has received a copy of the assessment, even if they have not fully completed it, is no longer eligible to take a makeup exam.

Virtual Learning:

In the event of inclement weather, campus closure/event, or other unforeseen circumstance, we may shift for a day to a virtual learning environment. In this case, I will notify you as soon as possible and provide you with a zoom link.. Such a transition will only be made on a temporary basis in the case of emergency, and will apply to the whole class. Virtual attendance options will not be available for individual students when the class meets in person.

AI Usage:

We understand that generative AI is a part of modern life, and has its uses- but like anything, it is just a tool. Responsible and ethical use of this tool in this course includes things like asking for a summary, alternative explanation, or additional source of material on a particular course topic you're struggling with, or for additional practice problems of a specific type.

However, please note that recent experience suggests AI is not always reliable, and you should always verify information obtained in this way with the official course materials.

You should also not ever transmit problems you intend to submit for grading to an AI or any other source to ask for a solution. Such an action constitutes academic dishonesty, and is a shortcut that will be detrimental to your learning in the long term.

Other Policies and Information

Academic Honesty:

All students are expected to comply with [the Georgia Tech Honor Code](#).

Any evidence of cheating or other violations of the Honor Code will be submitted directly to the Office of Student Integrity. In this course, such violations include, but are not limited to:

- Using a calculator, books, phone, or any form of notes or communication on tests.
- Submitting for grading work copied from **any** source, including friends, classmates, tutors, internet sources (including Wolfram Alpha, Generative AI, Chegg etc.), or a solutions manual.
- Allowing another person to copy your work.
- Taking a test or quiz in someone else's name, or having someone else take a test or quiz in your name.
- Asking for a regrade on work that has been altered from its original form.
- Fabricating an illness or other invalid excuse for taking a makeup assessment, or knowingly providing false information to the instructor for any reason.

Faculty and Student Expectations:

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and students. You may consult the official [Student-Faculty Expectations guide](#) as you wish, and in particular:

As your instructor, my role is to facilitate your learning by fostering an interactive, inclusive, and welcoming classroom environment. I will be available to answer your questions and provide clarifications outside of class; I regularly check email and Ed Discussion M-F between 8am and 5pm and will endeavour to reply within 24 business hours. I will grade your work consistently and in a timely manner and provide you with assessments that both develop and measure your understanding

and knowledge. I want to see you succeed in this class, and will work hard to make that happen!

As students, you are expected to attend and engage in the classes you've registered for. Please be sure to be on time and prepared for each class, and refrain from leaving early. You are expected to do your part in maintaining our welcoming, respectful, and interactive class dynamic- this includes your interactions with all members of the class and instructional staff, at any time and in any forum. We also expect that you will regularly monitor your GATech email and Canvas inbox, as well as the course announcements, so that you receive course information in a timely manner.

Inclusivity and Accommodations:

As members of the Georgia Tech community, we are committed to creating a learning environment in which all our students are able to thrive. Because we are individuals with varying needs, we are reliant on your feedback to achieve this goal. To that end, we invite you to engage in dialogue with us about the things we can stop, start, and continue doing to make our classroom an environment where you are supported and can engage actively in our learning community.

If you are in need of classroom or testing accommodations, please make an appointment with the Office of Disability Services to discuss the appropriate procedures. More information is available on [the ODS website](#). Please also let me know at your earliest convenience what I can do to make the course and materials most accessible to you. **I am open to suggestions that generally improve the usability of my course for everyone, not just those with officially documented accommodations.**

Please note that any visible accommodations provided in the classroom (especially during testing) may need to be justified to other students not able to receive that accommodation. If you wish to use such accommodations, please discuss them with me beforehand so that we can determine together the best way to allow you full use of your accommodations while protecting your privacy.

Please note: items on the syllabus and course schedule are subject to change. Any changes to the syllabus will be announced in class and through Canvas. A tentative schedule with important dates throughout the semester and information about office hours and other supports are posted on Canvas as a supplement to this document.

Here's to a great semester!