

COMPSCI 575 / MATH 513 COMBINATORICS AND GRAPH THEORY

3 credits, Fall 2022

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| Instructor: | Marius Minea |
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| Office: | LGRC A261, phone: (413) 545-1734 |
| Lectures: | Tuesdays and Thursdays, 1:00-2:15pm, Morrill 2 222 |

Teaching Assistant: Kyle Doney (kpdoney@umass.edu)
Graders: Pavan Datta Abbineni
Sai Veneer Vennam

Textbook:

Miklós Bóna, Introduction to Enumerative and Analytic Combinatorics, 2nd edition, CRC Press, 2016

Logistics: The course uses Moodle, Campuswire for communication, Gradescope for homework submission.

Office Hours:

Times for office hours will be posed and updated on Moodle. We encourage you to participate in office hours: this is a smaller and more personalized setting where we can discuss differently than in a large classroom. Your contribution to office hours helps create a learning community: you interact with other colleagues; this can help both you and others who might have similar questions or benefit from seeing a different approach or viewpoint. It also helps us instructors get to know you and have a better view on how the course is progressing.

Course Objectives The course aims to be a basic introduction to combinatorics and graph theory for advanced undergraduates in computer science, mathematics, engineering and science. It presents central topics in combinatorics and graph theory, including basic counting, arrangements, distributions, binomial identities, multisets and partitions, inclusion-exclusion principles, recurrence relations and generating functions, graph isomorphism and edge counting, Euler and Hamiltonian circuits, graph coloring, matching, symmetry groups, and Conway's theory of combinatorial games.

Learning Outcomes As a successful student, by the end of this course, you will be able to have a good image of the principal topics in combinatorics and graph theory, and be fluent in solving counting problems, use generating functions, construct combinatorial proofs, and prove various properties of graphs.

Prerequisites: mathematical maturity; calculus; linear algebra; strong performance in some discrete mathematics class, such as CS 250 or MATH 455. Modern Algebra (MATH 411) is helpful but not required.

Grading, exam schedule and makeup policies: Your grade for this course will be composed of:

- **Homework (50%):** There will be six homework assignments, usually due every two weeks. The weight of the lowest homework score will be reduced by 50%.
- **Exams (50%):** This course will have two midterm exams and one final exam.
 - **Midterm 1 (15%):** Wednesday, October 12, 7–9pm, location TBA
 - **Midterm 2 (15%):** Thursday, November 3, 7–9pm, location TBA
 - **Final Exam (20%):** Wednesday, December 14, 10:30 am–12:30 pm, Morrill 2 222

You must notify both instructors in advance if you are unable to take the exams at the scheduled time (e.g., due to illness). If a severe accident prevents you from communicating (or asking someone else to do it), you must notify the instructors as soon as you are able to. Failure to do this and missing the exam results in a grade of zero.

Tentative letter grade thresholds:

90: A 86: A- 82: B+ 78: B 74: B- 70: C+ 66: C 62: C- 58: D+ 54: D

These thresholds may be adjusted based on the overall performance of students in the course, but will not be more strict.

Attendance, late submission and exemption policies:

You are expected to attend lectures. This is the best way to engage in discussion and understanding of the material. If you cannot attend (e.g., for medical reasons), you are expected to watch the lecture recordings.

Turning homework in late helps no one. When you turn homework in late, you cannot receive feedback on time and risk falling behind, as the course has moved on to the next topic. Instructors cannot detect what material needs to be reviewed or discussed again, etc. Because of this, the general rule is that late homework will not be accepted. The only exception to this are justified medical or personal situations that fall outside the ordinary. In these cases, you must notify the instructors ahead of time and request an extension. We will review your request and decide if an extension is warranted. You should start homework early. A sudden happening on the due date, when you had planned on doing most of the work is not a reason for an extension.

All homework will be due in Gradescope at 11:59 PM on the due date. You have one late day to apply to the homework of your choice, without penalty.

Academic Honesty:

You are encouraged to form study groups, learn and discuss the course material jointly with others. All work submitted must be your own **in presentation**. You may discuss homework with other students, but the writeup **must** be your own work. Copying, or collaboration so close that it looks like copying, are not allowed. 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. If you make use of a printed or online source for the homework, other than specific course materials such as the textbook or web site, please mention it in your writeup.

You are encouraged to ask public questions, in office hours or on Campuswire. Your questions and the answers to them can be useful for others as well (and you are encouraged to help with answers). Public questions about homework should be of a general nature (clarification, applicable course material), and not involve specific solution ideas. Use private questions otherwise if needed.

As members of the College of Information and Computer Sciences at UMass Amherst we expect everyone to behave responsibly and honorably. In particular, we expect each of you not to give, receive, or use aid in examinations, nor to give, receive, or use unpermitted aid in any academic work. Doing your part in observing this code, and ensuring that others do likewise is essential for having a community of respect, integrity, fairness, and trust.

If you cheat in a course, you are taking away from your own opportunity to learn and develop as a professional. You also hurt your colleagues, and this will hurt people you will work with in the future, who expect an honest and responsible professional.

As faculty, we pledge to use academic policies designed for fairness, avoiding situations that are conducive to violating academic honesty, as well as unreasonable or unusual procedures that assume dishonesty.

We will follow the [Academic Honesty Policy and Procedures](#) established by the university to ensure that the learning environment is both honest and fair. Integrity is essential in all aspects of higher education, academic dishonesty is prohibited in all university programs, including this course. Academic dishonesty as defined by the University’s Academic Honesty Policy includes but is not limited to:

- Cheating - the intentional use or attempted use of trickery or deception in one’s academic work.
- Fabrication - intentional falsification and/or invention of any information or citation
- Plagiarism - knowingly representing the words or ideas of another as one’s own work
- Facilitating Dishonesty - knowingly helping or attempting to help another commit an act of academic dishonesty

Any violation of the Academic Honesty Policy could result in a failing grade in the course and initiation of the formal Academic Honesty Procedures of the University. Students are expected to be familiar with these policies, if you have any questions please email the course instructors for clarification.

The College of Information and Computer Sciences explicitly forbids any redistribution (including publicly available posting on an internet site) of any CICS course materials (including student solutions to course assignments, projects, exams, etc.) without the express written consent of the instructor of the course from which the materials come. Violations of this policy will be deemed instances of “facilitating dishonesty” (since a student making use of such materials would be guilty of plagiarism) and therefore may result in charges under the Academic Honesty Policy.

Accommodation Statement: Both the University of Massachusetts Amherst and your course staff are committed to providing an equal educational opportunity for all students. If you have a physical, psychological, or learning disability documented with Disability Services, please communicate your needs to us in the first two weeks of the semester so that we may make any necessary accommodations. If you are not sure if you qualify for an accommodation or if you have any questions on the topic of accommodations please contact Disability Services(<http://www.umass.edu/disability/>) for more information.

Equity and Inclusion Statement: We are committed to fostering a culture of diversity and inclusion, 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, sex, education, ethnicity, family status, gender, gender identity, geographical origin, language, military experience, political views, race, religion, sexual orientation, socioeconomic status, or work experience.

Because of that, one of the things we all need to realize is that we will be bringing different skills to the course, and we will all be learning from and with each other. Some of us are great artists, some of us aren't. Some of us have had previous experience with community organizing, and for some of us that may be something new. Some of us have very definite plans for our professional careers, some of us are still exploring. Each of these skills will help us succeed, both individually and as a group. Please be kind and courteous. There's no need to be mean or rude. Respect that people have differences of opinion, and work and approach problems differently. There is seldom a single right answer to complicated questions.

Please keep unstructured critique to a minimum. Criticism should be constructive. Disruptive behavior is not welcome, and insulting, demeaning, or harassing anyone is unacceptable. We follow the university's guidelines for classroom civility (http://www.umass.edu/dean_students/campus-policies/classroom). 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.

This course is for all of us. We will all learn from each other. This is our welcome.

Communication policy and response frequency We use Campuswire for communication. We will attempt to answer all questions within 24 hours and often much sooner. However, you should not rely on last-minute questions for help on homework. When needed, use private instructor-only posts rather than e-mail, this will make them more readily seen, and any of the staff team can answer them. For sensitive private matters, email the instructor.