

Syllabus

MATH 108: Introduction to Combinatorics

Spring 2020

This course is an introductory course in combinatorics. According to the official university policy (due to the Covid-19 situation), the course will be taught online. Many of the students are, according to the university policies, taking the course remotely from locations across the country and the world. This poses unique challenges.

Due to the unique circumstances, the course will be taught in an “Active Learning” style. This means that students will be expected to read the material in the textbook before the class meetings. The classes will be discussion based, where we will discuss the readings and clarify things that were confusing. Given that students will be learning remotely in their individual locations (far away from each other), this discussion based approach allows students to engage more actively with the material.

Normally, campus life and the interactions between students before, during and after classes (as well as in office hours and study groups) give students ample opportunities to discuss the class material with each other. This creates a group experience that is often motivating for everyone and makes students more engaged with the class. In contrast, if everyone is learning in a different location, and only virtual interactions are possible between students, students’ learning experiences might feel more isolating and less engaging. It is for this reason that a large amount of class time in this course will be devoted to in-class discussion of the material. It is therefore every student’s responsibility to prepare for class by carefully reading the assigned material (usually from the textbook).

Reading mathematics is often difficult and takes a lot of time. One has to go slowly and sometimes reread parts one has already read. Since students will be expected to devote a significant amount of time to the assigned readings before class, the amount of homework will be lower than usual (problem sets will be assigned only every other week).

Time: Tuesday, Thursday 10:30am - 11:50am in Pacific Daylight Saving time (Stanford time). The course will be taught online, and class meetings will be on Zoom (via Canvas).

Instructor: Lisa Sauermann
Email: lsauerma@stanford.edu

Course Assistant: Zhiqi Li
Email: zhiqi.li@stanford.edu

Office hours:
TBA (via Zoom)

Textbook:
Invitation to Discrete Mathematics by Jiří Matoušek and Jaroslav Nešetřil, 2nd edition
ISBN: 978-0198570431 (for hardcover version) or 978-0198570424 (for paperback version)
As Stanford students, you have *free* online access to this books via Stanford’s library website. If you wish, you can also buy a paper copy of the book.

Canvas:

All course materials (Zoom meeting links, homework assignments, quizzes) will be posted on Canvas (canvas.stanford.edu).

Grading policy:

According to the university policy for Spring quarter 2020, the course will not have a final exam. The grades will mostly be based on the homework assignments. A smaller part of the grade will be based on online quizzes about the readings. The precise break-down is as follows:

- Homework: 80% (lowest score dropped)
- Online quizzes about the readings: 20% (two lowest scores dropped)

Also according to the university policy for Spring quarter 2020, the grading basis for this course will be Satisfactory/No Credit (i.e. there will be no letter grades).

Homework:

There will be homework problem sets roughly every other week. You have to submit the homework online. You are welcome to either hand-write your solutions and scan them (or take photos), or to type them on a computer. In any case, your homework solutions must be readable (you won't receive credit for work that the grader can't read).

Your lowest homework score will be dropped to accommodate unforeseen circumstances (e.g. illness, technical issues). Late homework will not be accepted, and no make-up homework will be given.

The homework problems will have a range in difficulty and you should not expect to be able to solve the problems right away. If you are stuck on a problem for a while, you are more than welcome to ask for help in office hours.

You are encouraged to work together with each other on the homework, for example in online study groups. I recommend that you first think about each problem yourself for a bit before discussing it with others (I believe that this way you will understand the problem better and learn more from it). In any case, you are required to write down the solution yourself in your own words (without looking at other students' write-ups).

Quizzes:

Before each class, you need to complete an online quiz on Canvas on the assigned reading. Each quiz will consist of two parts. The first part will be asking basic questions about the reading. This part will be graded and form a small portion of you course grade (see above).

The second part of each quiz will ask you which parts of the reading you found confusing and whether you have any questions about the reading. Your answers in the second part of the quiz will *not* be graded. Instead, they will be used by the instructor to gauge which points in the reading were most confusing to students, and these points will be addressed in the in-class discussion.

The quiz is open-book (i.e. you are allowed look at the textbook while answering the quiz). However, if you have to heavily rely on the book in order to answer the questions, this might suggest that your understanding of the reading is fairly incomplete. In this case, you might want to revisit the reading again.

Each quiz will be due at 6pm Pacific Daylight Saving time (Stanford time) on the day before class (i.e. Monday or Wednesday). You will have a 30 minute window to complete each quiz

(the 30 minutes start when you begin the quiz). In practice, completing the quiz will most likely take much less than 30 minutes (the window is chosen so long to give you a time buffer in case of technical problems). Your two lowest quiz scores will be dropped to accommodate cases of severe internet connection problems (that cannot be resolved within 30 minutes) or other unforeseen situations.

Schedule:

The following is a tentative schedule for the class (this schedule is subject to change). The precise reading assignments will be posted on Canvas.

- Week 1: Introduction, sets and functions
- Week 2: Mathematical induction
- Week 3: Counting, factorials and binomial coefficients
- Week 4: More counting, estimates and inclusion-exclusion
- Week 5: Graphs
- Week 6: Trees
- Week 7: Double-Counting
- Week 8: The number of spanning trees
- Week 9: Recurrences
- Week 10: TBA

Materials required for this class:

- Access to the textbook (you can either purchase a paper copy, or access the textbook for free online via Stanford's library website).
- A reliable internet connection and a computer or tablet to participate in the class meetings (a smartphone screen will be too small).
- A way to scan hand-written homework solutions or a computer to type your solutions (there are free smartphone apps that you can use to scan hand-written solutions into pdf).
- A quiet environment to study and to participate in class meetings.

If any of the above poses a problem for you, please reach out to the instructor via email. I will try to connect you to university resources to find a solution.

Course-related expenses:

All students should retain receipts for books and other course-related expenses, as these may be qualified educational expenses for tax purposes. If you are an undergraduate receiving financial aid, you may be eligible for additional financial aid for required books and course materials if these expenses exceed the aid amount in your award letter. For more information, review your award letter or visit the Student Budget website:

<https://financialaid.stanford.edu/undergrad/budget/index.html>.

Students with Documented Disabilities:

Students who may need an academic accommodation based on the impact of a disability must initiate the request with the Office of Accessible Education (OAE). Professional staff will evaluate the request with required documentation, recommend reasonable accommodations, and prepare an Accommodation Letter for faculty. Unless the student has a temporary disability, Accommodation letters are issued for the entire academic year. Students should contact the OAE as soon as possible since timely notice is needed to coordinate accommodations. The OAE is located at 563 Salvatierra Walk (phone: 723-1066, URL: <https://oae.stanford.edu/>).

Your mental health is very important, and this is a challenging quarter for everyone. There are different resources available, see <https://mentalhealth.stanford.edu/> for a general overview.

Academic Integrity:

The Honor Code articulates Stanford University's expectations of students and faculty in establishing and maintaining the highest standards in academic work. Examples of conduct that have been regarded as being in violation of the Honor Code (and are most relevant for this course) include copying from another student's work or allowing another student to copy from your own work; plagiarism; revising and resubmitting your work for regrading without the instructor's knowledge and consent; representing as one's own work the work of another. See <http://communitystandards.stanford.edu/> for more information on the Honor Code.

FAQ:

- Is participation in the class meetings mandatory?
Participation in class meetings is not mandatory, but highly recommended.
- Will the classes be recorded?
No, classes (and office hour meetings) will not be recorded. You can participate live via Zoom, but you can't view the class at a later time. The reason for this policy is that students should feel comfortable to ask questions and contribute to in-class discussions (and some students may feel less comfortable to do so if the classes were recorded).
- What if I am in a different time zone, and therefore can't participate in the class meetings?
Class participation is not mandatory. I will send out a questionnaire in the beginning of the quarter to ask which time zone you are located in. The teaching staff will do their best to offer at least one hour of office hours per week at a time that is between 8am and 9pm in your time zone. If you can't participate in the class meetings, you can ask your questions about the readings during those office hours.
- Will what I say in class meetings be part of my grade?
No. Whether you participate in class meetings, and what you ask or say during class meetings will not be part of your grade. Of course, all students are encouraged to participate in class meetings, ask questions, and contribute to the discussion.

Should any exceptional circumstances arise, please contact the instructor. We will try to find a solution.