

Introduction to combinatorics (Math 318) Sabancı University, Spring 2020-2021

This syllabus may be subject to update and change.

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Office Hour: By appointment. Students are encouraged to make use of flexible online office hours. Send me an email if you have questions, and I will set up a zoom meeting at the earliest available common free hour.

Lecture Hours: Tuesdays 14:40 - 16:30 and Thursdays 11:40 - 12:30.

You must attend the synchronous Zoom lectures, office hours and real-time online exams with your SU email account.

Lecture Format: Lectures will be live-streamed (Tuesday and Thursday) unless a technical difficulty occurs. You can find the Zoom links for the lecture on SUCourse+.

In order to have access to them, you must be logged in with your Sabancı account. The online lectures will be made available afterwards, so that you can also watch them at a later time. They are going to be published on SUCourse+ via Google Drive. You will find a tentative breakdown of course material in the syllabus.

You are responsible for every announcement made in the online lecture or in SUCourse+. Not attending the online lecture or not following SUCourse+ regularly is not an excuse, in case you miss something.

Objectives

1. To improve mathematical proof writing skills.
2. The first half of the course will cover Enumeration. Student will learn the basic notions, methods, and problems of Enumerative Combinatorics. The focus will be to develop foundations in solving counting problems, and use them to study discrete structures.
3. The second half will cover Graph Theory. Student will learn the basic notions in Graph Theory with a focus on learning the solution of graph theoretical problems.

Textbook

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1. Richard A. Brualdi, Introductory Combinatorics, Prentice Hall.?
2. Miklos Bona, A Walk Through Combinatorics: An Introduction to Enumeration and Graph Theory, Second Edition (World Scientific, 2006).

Tentative Course Outline

Below is a very hopeful tentative breakdown of topics. It may vary due to time and holiday constraints.

Week	Topics (Sections from the textbook)
1	What is enumerative combinatorics?
2	Permutations and combinations
3	The pigeonhole principle and review of mathematical induction
4	The binomial and multinomial theorems
5	Principle of inclusion-exclusion
6	Applications of Principle of inclusion-exclusion
7	Recurrences and generating functions
8	Special Counting sequences
9	Introduction to graph theory (Basic concepts)
10	Hamilton paths and Cycles, trees and number of spanning trees of a graph
11	Coloring and matching of graphs
12	Plannar graphs and coloring maps
13	Digraphs and networks
14	Selected topics

Grading:

Your grade exclusively depends on the below listed items. **There will be no other extra-credit opportunities.**

Midterm	35%
Final (date TBA)	35%
Online Quiz	25%
Lecture Participation	5%

The passing grade will be determined after the last exam. Be aware that this passing grade may not match the overall average of the students.

Important Warning:

Every document that requires a student submission,

- must be in **pdf** format, and **hand-written**,
- must have **name, surname, student ID, and signature** on the top left corner of the document **on each page** submitted,
- **Sabancı Student ID card** must be placed on the top right corner of the **first page**.

Submissions must be uploaded as a **single pdf file**. Any submission that is not in the described format will **NOT** be taken into account. Moreover, any solution that contains notations that are not used in the lectures/recitations will be completely ignored.

Exam:

The **midterm exam** will be given online on April 13, 2021 during lecture hours.

The **final exam** will be given online, at the end of the semester. The date will be announced by Student resource. More details will be announced on SUCourse+ in due time.

Both exams will be online proctored and recorded. For proctored exams, your webcam and microphone should be on during the exam. In the case of non-compliance with this and other declared exam procedures, your exam will be void. Make sure to check that your webcam and microphone function properly before the exam.

Online Quiz:

The online quiz will be given during the lectures. They will be either in the form of SUcourse+ quiz OR you will be asked to solve the questions on A4 size papers to be submitted as in the format prescribed above. There will be at least 8 quiz given and the best 6 of your quiz scores will determine the online quiz grade. **There will be no make up for any of these quiz for any reason.** Students found having a behaviour in contrast with Academic Integrity multiple times, will receive 0 from the online quiz Grade.

Lecture Participation:

I strongly encourage students to participate in lecture by asking question so that we can have an interactive class environment. In each lecture, a certain number of pop-up questions will be presented to the students, via Zoom polls. The active participation of students in Zoom polls will determine their Lecture participation grade.

The best 12 lecture participation scores will be counted to determine "Lecture participation grade". Students with time conflicts, please see the **Registration Overrides section** of the syllabus. Students are responsible to take care of lecture attendance related issues that may arise due to Time conflict.

Weekly worksheets

Weekly worksheets will be uploaded on SUcourse+. Solution of worksheets will NOT be provided. It is for you to solve to get a better understanding of the topic. However, I invite all students to discuss those exercises with me or your TA during office hours.

Make Up Policy

Make-ups are only allowed for the midterm and the final exams. Since there is limited access to health services during this period, any verbal (and legitimate) excuse can be accepted, provided that you contact the instructor **beforehand**. Any excuses that will be taken into the instructor's account after the exam will not be considered. **No exceptions to these rules.** Makeup for the midterm or the final exam will be held at the end of the semester. The make-up exam will contain all topics covered throughout the semester. The make-up exam will be done as a face-to-face online verbal exam. .

One can have a make-up exam for **ONLY** one of the exams. If a student miss both (Final and Midterm) exams even with a valid excuse , then he/she will be allowed to take make-up for Final exam only, and receive 0 points for Midterm exam.

Academic Honesty

All university policies on academic integrity apply to our course, and they will be enforced. (more information on <http://www.sabanciuniv.edu/en/academic-integrity-statement>).

In particular, no form of cheating is welcome in the exams or quizzes, such as copying whole or part of each other's answers, using cheat-sheets etc. The action against such violations could range from getting a zero on the particular exam to explaining the case in front of the Disciplinary Committee.

After any submission (i.e. online assignments, midterm exam, final exam), some of the students may be called for an oral examination. In this case, some students will be selected randomly and some will be selected based on any irregularities in their performance and/or level of work they submit. Oral examinations will be done over Zoom and each oral examination will be recorded. During an oral examination, students must (i) keep their camera on at all times, (ii) share their entire screens (not specific tabs or windows). Performance of the student in an oral examination will affect their grades of the grading item they have been called upon. If a student fails to show up at an oral exam, or does not obey the aforementioned rules, (s)he will automatically get 0 (zero) points from that grading item.

Suggestions:

- Feel free to ask me and your TA questions in and out of class, especially during office hours.
- In Math318, learning formulas or memorizing Theorems will not help much. You must practice and solve as many exercises as possible to get a decent command in the topic. This course is not difficult, however, it requires proper attention and time.

- Studying out of class for this course should become a routine. Key to success in mathematics is practice.
- Students are expected to follow the announcements made during the lectures or in SUCourse. Not attending the class or not following SUCourse+ regularly is not an excuse, in case you miss something.

Registration Overrides

Time conflict requests for lecture hours are permitted only in very special circumstances. However, any and all negative outcomes that may result are solely the student's responsibility. Note that 30% of the total grade is Online Quiz and Lecture participation, and both of these activities will be done during the lecture.