

Linear Algebra (Math 201)

Sabancı University, Fall 2021-2022

*This syllabus may be subject to update and change in unforeseen circumstances.
Updated on January 4, 2022. The additions are shown in red.*

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Office Hour: Mondays 17:40 - 18:30 and Wednesdays 13:40 - 14:30 or by appointment.

Class Hours and Lecture Format: Lectures will be in-class and simultaneously live-streamed via Zoom. For those of you who wish to follow online, the Zoom links are posted on SUCourse+. In order to have access to them, you must be logged in to Zoom with your Sabancı account.

The lecture recordings will be made available afterwards, so that you can also watch them at a later time. They are going to be posted on SUCourse+. I will also share some material for you on SUCourse+ to read or watch before/after the lectures. You will find a tentative breakdown of course material in the syllabus.

Lecture Hours:Section A:Tuesdays 08:40-09:30 (FENS G077) and Thursdays 08:40-10:30 (FENS G077).
Section B:Tuesdays 09:40-10:30 (FENS G077) and Thursdays 14:40-16:30 (PAC - SGM).

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.

Recitation Hours: Fridays 10:40 - 11:30 (A1, A2, A3, A4),
Fridays 11:40 - 12:30 (B1, B2, B3, B4),
Fridays 14:40 - 15:30 (C1, C2, D1, D2),
Fridays 15:40 - 16:30 (E1, E2, E3, E4),
Fridays 16:40 - 17:30 (F1, F2, F3, F4).

Recitation Format: Recitations will be live-streamed and held as Zoom polls integrated discussions with the TAs via Zoom. You can find the Zoom links for recitations on SUCourse+. In order to have access to them, you must be logged in with your Sabancı account. Students must attend the online recitation classes to which they are registered.

Course Content: Systems of linear equations, Gaussian elimination, vector spaces, subspaces, linear independence, dimension, change of bases, linear transformations, inner product, orthogonality, eigenvalues, eigenspaces and diagonalization.

Objectives: This course aims to introduce basic concepts of linear algebra such as vector spaces, bases, linear transformations, eigenvalues and eigenspaces. The course gives students training to develop their mathematical skills, analytical and critical thinking abilities, their ability to apply these capabilities to practical problems, and to communicate their knowledge of these areas.

Course Support Materials:

- Strang, G., Introduction to Linear Algebra, 5th edition, Wellesley-Cambridge Press and SIAM, 2016. (Majority of homework problems will be assigned from this book.)
- Axler, A., Linear Algebra Done Right, Springer.
- Leon, S. J., Linear Algebra with Applications, Prentice Hall.
- Bretscher O., Linear Algebra with Applications, 2nd Edition, Prentice-Hall, 2001.
- Poole, D., Linear Algebra: A Modern Introduction, 3rd Edition, Brooks Cole, 2011.
- Friedberg, S., Insel, A., Spence, L., Linear Algebra, 4th edition, Pearson, 2013.

Tentative Course Outline:

- Week 1-4: Introduction to vectors, matrices, solving linear equations
- Week 5-6: Vector spaces and subspaces
- Week 7-9: Linear transformations
- Week 10: Determinants
- Week 11-12: Eigenvalues, Eigenvectors, Diagonalization
- Week 13: Orthogonality
- Week 14: Applications (if time allows)

Learning Outcomes:

On completion of this course the student should be able to:

- Understand the notion of mathematical thinking, mathematical proofs, and able to apply them in problem solving.
- Present simple proofs in a precise and formally correct way.
- Solve a system of linear equations using matrix reduction.
- Do basic arithmetical operations with matrices.
- Understand the notions of linear independence, basis and dimension of a vector space.
- Find a basis and dimension of Euclidean or abstract vector spaces.
- Geometrically interpret the above concepts.
- Represent linear transformations as matrices and, conversely, interpret matrices as linear maps.
- Compute eigenvalues and eigenspaces of matrices.
- Identify whether a matrix is diagonalizable or not.

Grading:

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

Midterm (06.11.2021 at 15:30)	35%
Final (16.01.2022 at 09:00)	40%
Self Study (Online Assignments)	15%
Lecture Attendance	5%
Recitation Grade	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.

Midterm:

The midterm exam will be given in-person, on campus. The date will be announced later. More details will be announced on SUCourse+ in due time.

Final Exam:

The final exam will be given online. It will be online proctored and recorded. In order to be able to take the final exam, you have to have:

- A computer with working microphone and camera.
- A stable internet connection.
- A properly lit, quiet room.
- A desk with nothing on it except your computer, your Sabancı ID card (or any photo ID), blank sheets of A4 paper for your solutions, a pencil, eraser and water (if needed).

These are the minimum requirements; you cannot take the exam without having these.

In the case of non-compliance with these and other declared exam procedures, your exam will be void. Make sure to check that your webcam and microphone function properly before the exam. More details will be announced on SUCourse+ in due time.

Self Study (Online Assignments):

This consists of online assignment which will be given via SuCourse+, consisting of up to 3 problems. You will be asked to solve the questions on A4 size papers to be submitted as in the format prescribed below. There will be 5 such online assignments. The best 3 of your online assignment scores will determine the self study grade. **There will be no make up for any of these assignments for any reason.** Students found having a behaviour in contrast with Academic Integrity multiple times, will receive 0 from the Self Study Grade.

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 or a valid ID card with name and photo on it** 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.

Lecture Attendance:

In-class quizzes will be given randomly to check lecture attendance. These quizzes will be given as Tophat questions. Make sure that you have a Tophat account with your sabanciuniv.edu address. There will be no make-up for those quizzes. Best 70% percent of them will be counted. Students with time conflicts, please see the Registration Overrides section of the syllabus.

Recitation Grade:

You are expected to study the lecture notes before you enter the recitation so that you can actively participate in the discussion. In each recitation, a certain number of pop-up questions will be presented to the students, via Zoom polls. Students attending their correct Zoom sessions will get participation point if they also answer all of the questions. Disturbing your classmates, being late, leaving early during online classes will not be tolerated and will affect your recitation grade. At the end of the semester, the best 8 scores will be counted for the final recitation grade.

Supplementary Exercises:

There will be supplementary exercises assigned each week via SuCourse+. You are not expected to return the solutions but you are strongly advised to solve them (even if not in full detail) before the recitation. It will be given in two parts, the ones that will be solved in the recitation and the ones whose recorded solutions will be shared via SuCourse+ later on.

Make Up Policy:

Make-ups are only allowed for the midterm and the final examinations to those with an official report and to those with an official permission notice from the university on the date of the exam in question. Students must submit their reports/notices to the instructor before the exam in question. The ones having other excuses should contact the instructor within the day of the exam to be missed and then it will be decided whether these students are allowed to take the make-up exam. Any excuses to be brought to the attention of the instructor after the exam will not be considered. No exceptions to these rules! Dates and details of the make-up examinations will be announced later.

The make-up exam for the final will contain all topics covered throughout the semester. The make-up examination for the final will be done as a combination of online oral and written exam.

If the student do not contact with the instructor and do not take neither the exams nor the make-up, then (s)he gets NA (even though online assignments and attendance checks appear in the grading).

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. Students are not allowed to give or receive outside help. 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.

In online assignments or exams, if we suspect any breach of academic integrity, we may ask for an oral validation of the quiz/exam. In this case the student will be invited to an oral interview and will be given the opportunity to explain their solution. If the student cannot provide sufficient explanations, or does not show up to the interview, their quiz/exam grade will be replaced with zero (0).

Class Discipline:

It is our responsibility to provide students with excellent teaching and learning environments. We are therefore asking you to respect both our responsibility to teach and the right of other students to learn. Any action that disturbs your classmates or disrupts the online activities is unacceptable. Repeated violations of the above common sense rules may cause a student to be counted as absent for a lecture or a recitation.

Attention must be taken regarding COVID-19 spread prevention. Students attending classes must comply with the rules list at <https://mysu.sabanciuniv.edu/en/covid-19-rules>, especially those regarding "OPEN AND CLOSED AREAS". The maximum capacity of the classrooms will always be respected and students are required to correctly wear a mask and sit only in the designated seats at all time. The class may not start, or may be suspended, otherwise.

Suggestions:

- Feel free to ask me and your TA questions in and out of class, especially during office hours.
- Math 201 is a combination of computational mathematics and theoretical mathematics (that is abstract definitions and Theorems). The computational aspects of the course will feel more familiar

and easier to grasp, but we will also focus on the theoretical aspects of the subject. Whenever you encounter an abstract concept in the lecture, take a pause and give yourself some time to think about it.

- In linear algebra, definitions and Theorems build on each other quickly. If you fall behind, it will be difficult to catch up. Work hard from the beginning, and come to office hours immediately if you do not understand something.
- 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 will be accepted. However, any and all negative outcomes that may result are solely the student's responsibility.