

MATH 3120: LINEAR ALGEBRA, SUMMER 2022

Instructor: Avik Chakravarty
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Course website: under construction.

Lectures: Class meets Mondays and Wednesdays 12:00PM-3:50PM from June 30 to August 5, 2022. First day of class is on July 6, 2022.

Office Hours: to be decided after consultation with the students.

Prerequisites: Students should have taken Math 2400 and are expected to be familiar with single variable and multivariable calculus at the level of Math 1300 and Math 1400.

You should be fine if you are able to multiply matrices, know what elementary matrices are and how to use them to row-reduce matrices. I will provide specific notes on the things we need for this course. Chapter 1 and 2 of Stang’s “Introduction to Linear Algebra” should be more than enough. (Also you need to know how to integrate and differentiate functions with multiple variables.)

Since this course is proof-based, it will help if you are already familiar with proof-writing. Linear algebra is a great background for learning how to do proof-based math and the course is designed to teach proofs as well as linear algebra. So, you should be okay even if you have not taken a proof-based course before.

Topics: We will discuss following topics in this course:

- (1) Vector spaces: basic definitions, linear independence, bases, dimension.
- (2) Linear Maps: composition, matrix representation, isomorphisms, change of coordinate matrices, system of linear equations revisited.
- (3) Determinants: definitions, different characteristics.
- (4) Diagonalization: eigenvalues, eigenvectors, diagonalizability, Cayley-Hamilton, minimal polynomial.

References:

- (1) Primary reference will be the lecture notes provided by the instructor.
- (2) Optional textbooks for reference:
 - “Linear Algebra”, 4th Edition, by Friedberg, Insel and Spence.
 - “Linear Algebra with Applications”, 5th Edition, by Bretscher.
 - “Introduction to Linear Algebra”, 5th Edition, Gilbert Strang.

Homework: There will be four homework. All homework will count towards the final grade. *Late submissions will not be accepted.* Homework must be submitted via Gradescope on Canvas. Homework will be due on Fridays at 7:00pm. Homework 0 consists of basics about matrix multiplications, row-reduction and permutations.

Date: Late updated on June 25, 2022.

Avik Chakravarty, Department of Mathematics, University of Pennsylvania.

Students will be given the homework on the first day of class and are expected to submit it by July 22nd. All other homework will reflect topics covered in class.

Exam: There will be a midterm (date: July 26, 2022) and it will be held in person.

Final Project: In stead of a final, we will have a final project which consists of a presentation and paper submission. The project should involve topics in math and/or other disciplines that uses linear algebra in a non-trivial way. A potential list of topics will be given by the instructors. However students are welcome to suggest their own topic.

Class participation: Students are expected to regularly participate in class to solve problems together. There will be a group-based problem solving session in every class where students are expected to work on assigned problem sets together.

Class structure: Every class will cover two topics and each topic will have a lecture and in-class problem solving component. We will take short breaks between each activity.

<i>Topic #</i>	<i>Type</i>	<i>Length (in minutes)</i>
1	Lecture	45
1	Problem-solving	50
2	Lecture	45
2	Problem-solving	50

TABLE 1. Class structure.

Grade Distribution:

<i>Type</i>	<i>Percentage</i>
Homework	40%
Midterm	25%
Final project	20%
Class Participation	15%

TABLE 2. Grade distribution for the course.

Deadlines: The final deadline for all submissions are given below in the order they will be due.

<i>Type</i>	<i>Deadline</i>	<i>Method of submission</i>
Homework 0	July 22, 7:00pm	via Gradescope
Homework 1	July 15, 7:00pm	via Gradescope
Homework 2	July 22, 7:00pm	via Gradescope
Midterm	July 26, noon	in class
Homework 3	August 03, 7:00pm	via Gradescope
Final project	August 03, noon	in class.

TABLE 3. Deadline for submissions.

Academic Integrity: Please read the code of academic conduct. Violations of academic integrity may result in a zero score for an entire assignment or the course

project, and may be referred to the Office of Student Conduct for further disciplinary actions.

Covid-19 Related Policy: Students are required to wear masks during class by the latest university policy. We will follow this policy unless otherwise instructed.

Additional Policy: Please do not share any course materials, including the references, supplementary materials, posts in the discussion board, etc., or any course links to people outside of this class.

Academic Accommodations: Academic Accommodations: If you have a documented disability requiring academic accommodation, please have the Office for Student Disability Services (SDS) provide a letter during the first two weeks of classes.