# MATH-UA 140: LINEAR ALGEBRA

New York University – Spring 2024 – Syllabus

**Professor:** Dr. Yiping Lu
**Course Webpage:** https://2prime.github.io/teaching/2024-linear-algebra

**Email:** yiping.lu@nyu.edu
If you wish to contact me via email, kindly include the tag "[linear algebra]" in the subject line. This will help ensure that I do not overlook your message. Better way to approach me is using brightspace or campuswire

**Office Hours and Communication:**
- For content questions or help with the HW:
    - Ask on the weekly Campuswire threads that I reply to daily (excluding weekends).
    - See TA office hours below.
    - Check out free tutoring options (Brightspace/Content/General Resources).
- If you need to meet to discuss something personal/that cannot be discussed on Campuswire or with the TA:
    - DM on Campuswire to schedule an appointment.
- Please **always utilize Campuswire instead of emailing** – this helps centralize conversations between us.

## TEACHING ASSISTANTS AND RECITATIONS

### Lecture Section 16 (RGSH 203, MW 930 pm)

| Time | Location | Section | TA | Email | Office Hours |
|------|----------|---------|-----|-------|--------------|
| 9:30 | GCASL 269 | RGSH 202 | Ao Xu | ax2183@nyu.ed | |

### Lecture Section 11 (19W4 101, MW 330 pm)

| Time | Location | Section | TA | Email | Office Hours |
|------|----------|---------|-----|-------|--------------|
| 12:30 | SILV 410 | 12/CRC1 | Animesh Ramesh | ar8006@nyu.edu | |
| 8:00 | SILV 403 | 13/CRC2 | | | |
| 3:30 | SILV 407 | 14/CRC3 | Adithya Jairam Vedagiri Lyer | ai2257@nyu.edu | |
| 11:00 | GCASL 379 | 15/CRC4 | | | |

## COURSE DESCRIPTION AND GOALS
Linear algebra is a cornerstone in any mathematics curriculum for two important reasons:
1) The theory of linear algebra is well understood, and a first step in many areas of applied mathematics is to reduce the problem into one of linear algebra.
2) Vector spaces and linear operators studied in linear algebra are found in many different areas of mathematics, science and engineering.

Students will leave the course with a computational ability and conceptual understanding of solving linear equations, vector spaces and subspaces, orthogonality, determinants, eigenvalues and eigenvectors, linear transformations, and matrix factorizations (such as LU, QR, and SVD).

## MATERIAL AND ORGANIZATION

### Book
Gilbert Strang, *Introduction to Linear Algebra*, 6th edition, Wellesley-Cambridge Press, 2023

### Brightspace and Campuswire
The syllabus, course calendar, homework problem sets, and solutions will be uploaded to Brightspace. All other

communications will be handled through Campuswire, so make sure to check it very regularly. You should also ask any question regarding the class there (this can be anonymous). I will periodically offer some input, but it should first and foremost remain a platform for you and your classmates. For personal questions, send me a DM there. Please make sure you check Campuswire regularly, especially before messaging me to make sure that your question hadn't been answered there. When messaging, please practice professional etiquette, including complete sentences and correct grammar. I usually reply within a business day (24 working hours). If I don't and it is an urgent matter, please follow up. Please do not DM on Campuswire and email, only use Campuswire.

### Gradescope

All assignment and assessments will all be administered through Gradescope. You will be able to see your graded assignments and comments from the grader there. Gradescope is available through Brightspace: you should use your NYU email address to register.

### ASSIGNMENTS AND ASSESSMENTS

### Grading Scale

Please do not inquire for curves on individual assignments or assessments, grades will be assigned equitably.

| A | A- | B+ | B | B- | C+ | C | D | F |
|---|----|----|---|----|----|----|---|---|
| [100-93] | (93-90) | (90-87) | (87-83) | (83-80) | (80-73) | (73-65) | (65,50] | <50 |

### Incomplete Grade

University policy states that an incomplete grade may be awarded if the student is unable to complete their work on time due to circumstances beyond their control. Please refer to the academic policies page for more information.

### Grading Distribution

- Attendance & Participation      5%
- Quizzes      15%
- Problem Sets      10%
- Exams      70%

### Attendance & Participation (5%)

Attendance is expected and required during lecture even though you won't be graded on it. Students are responsible for missed announcements, instructions, and any communications during lecture. You should attend every time you are able to. In **recitation**, attendance is part of your grade. Your TA will take attendance via a traditional sign-up sheet. You are allowed 3 free recitation absences without penalty. Every absence after the 3rd one will result in a 0.5% deduction. No additional considerations will be made so please use your absences wisely.

### Quizzes (15%)

There are weekly quizzes (on Gradescope, generally timed for 30-45 minutes) due by midnight on most Sundays as indicated on the schedule. Quizzes typically open on Friday evenings and you can take them anytime over the weekend. Moreover, your lowest quiz grade will be dropped. No further extensions or considerations will be given.

### Problem Sets (10%)

Problem sets will be posted to Brightspace/Gradescope. A final draft of your writeup must be submitted in PDF. It should include your thought process, calculations showing all work and citations of theorems and definitions used. For all problem sets, you are highly encouraged to work in groups. Problem sets will be due by midnight on Fridays with only one late assignment (up to 12 hours) accepted per student. Moreover, your lowest problem set grade will be dropped. No further extensions or considerations will be given.

### Exams (70%)

There are 2 exams in the course as indicated on the schedule – a midterm and a noncumulative final. Please do not inquire about curves, grades will be assigned equitably. More information about the weight distribution will be communicated throughout the semester.

**Absences**
There is no need to message me for each absence, except for reasons that will hinder your ability to keep up with the class for a significant amount of time. Since you have a week to finish most assignments, no delay will be accepted for any reason. Moreover, the generous drop policy for assignments is meant to consider acceptable reasons for absences: sickness, religious holiday, or personal emergencies. It is also perfectly fine to miss a homework assignment or a quiz to recuperate! You should message me if you cannot attend an exam for a valid reason (illness, religious holiday, or family emergency). In this case, you need to let me know in advance. Absences that are not communicated in advance will not be excused.

**Accessibility**
Students requesting academic accommodations are advised to reach out to the Moses Center for Student Accessibility as early as possible in the semester for assistance.

<div align="center">

Telephone: 212-998-4980
Website: http://www.nyu.edu/csd
Email: mosescsa@nyu.edu

</div>

Remote drop in meetings with an Accessibility Specialist are available. To request a remote meeting email mosescsa@nyu.edu and an Accessibility Specialist will reach out to you with a Zoom link. If you are already working with the Moses Center, then please be in touch with your Accessibility Specialist with any questions or concerns related to the provision of their services. Please note that it is **your responsibility** to schedule exams at the Moses Center, and to ensure that you are receiving all accommodations you are approved for.

**Class Conduct**
Even though this is a distance delivery course, I expect exemplary in-class conduct and professional behavior during the synchronous sessions. You are to attend on time and stay for the entire class time, otherwise you may be counted as absent. Points may also be taken off for inappropriate conducts that include but are not limited to: talking randomly in class, leaving early without permission or joining very late. Each time I find improper behavior, you may receive a 1% deduction from the final grade.

**Academic Integrity and use of Artificial Intelligence**
Academic integrity is the cornerstone of the university. You assume full responsibility for the content and integrity of the academic work you submit. The guiding rule of academic integrity shall be that your submitted work, examinations, reports, and projects must be your own work. You are expected to read and understand the university's policy on academic integrity as laid out in the Academic Integrity for Students at NYU policy. Plagiarism and cheating will be penalized and reported. A list of tools that may lead to a violation of the academic integrity policy includes (but is not limited to): Chegg (or any similar platform), Wolfram Alpha (or any similar platform), handheld or online calculators, and other individuals taking the assessment in lieu of a student. Any suspicion of cheating will be thoroughly investigated. If I suspect that a student cheated on an assessment, I may request a meeting where said student will be expected to work through a similar problem and/or explain their work verbally. This meeting may be done with me, a class TA, or another faculty member. If the student is unable to explain the work, or is not willing to meet, they may automatically get a grade of F in the class and be reported to their dean.
1. Use of AI for Homework:
   - While the use of AI tools to aid in problem-solving is becoming increasingly prevalent, it is important to note that relying solely on AI to complete your homework is not in accordance with the expectations of this course.
   - The primary goal of this class is to enhance your understanding of statistical concepts and develop problem-solving skills. Using AI tools to automatically generate solutions without actively engaging in the learning process may hinder your long-term progress and comprehension of the subject matter.
   - It is essential to maintain academic integrity and avoid plagiarism by properly crediting all sources of assistance in your homework. Submitting AI-generated solutions without proper acknowledgment is a violation of ethical guidelines and academic standards.

2. Recommendations for Effective Learning:
   a. Engage actively with the course materials, including lectures, textbooks, and supplementary resources. Attempt problems independently before seeking assistance to develop a strong foundation in statistics.
   b. Get to know your classmates and seek out opportunities for group discussions and collaborative problem-solving sessions. Explaining concepts to others and engaging in dialogue can deepen your understanding and expose you to different problem-solving approaches.

c. If you encounter difficulties or have questions regarding homework problems, consult your instructor on Campuswire, TA, or classmates to gain further insights and clarification. Free ULC tutoring is also available. Discussion forums are valuable resources for additional guidance.

3. Consequences on Exam Performance and Course Evaluation:
a. The exams in this course are designed to assess your comprehension, problem-solving abilities, and critical thinking skills. Relying excessively on AI tools during homework assignments may result in a lack of readiness for these assessments.
b. Overreliance on AI can hinder your ability to apply statistics and probability principles to new and unfamiliar problems, leading to potential difficulties in exams. It is important to develop and refine your own problem-solving strategies to excel in this course.
c. Any violation of the course's academic integrity policy, including the misuse of AI tools, will result in disciplinary actions, such as reduced grades, academic probation, or even expulsion, as determined by the dean's office.

### ADDITIONAL INFORMATION
**Study Assistance**
**Office hours and Campuswire**: The TAs and I are here to help! It's our goal to see you succeed in this class! If you cannot meet during the schedule office hours, please DM to set up a time to meet. Please also look at and participate in the HW threads on Campuswire – they are extremely helpful, and I offer input frequently!
**The book:** The book is adopted because the authors do a great job explaining everything in detail. Each section includes explanations and examples to help guide you.
**Tutoring:** Take advantage of the tutoring and learning resources offered by NYU. Please check the university learning center's webpage as well as the Courant Undergraduate Tutoring Center for more information.

### Advice
The only material that you are expected to know is what is covered in class, readings, relevant book sections and in the live lectures. Any exercise seen in class, the homework, or in the book is fair material on a test. However, tests may include other types of problems that are relevant to the material. This course will include a good amount of reading to discuss the historical and social background behind topics we will cover. Be ready to write some essays or opinion pieces as well.

Keep in mind that whenever you study, you must study actively, with a pen and a piece of paper. Math is all about practice. Reading or attending class is not enough. This means the following.

- Write down the relevant definitions, formulas, and theorems.
- Redo the examples seen in class.
- Do the homework afterwards. These exercises are tailored so that you should be able to do most of them by yourself after going through the notes. Discuss topics that you have trouble with on Campuswire.

If at any point, you feel confused or do not know how to solve an exercise, please go to the TA office hours, get help through free tutoring or ask questions on Campuswire and I will answer. Many exercises of the assessments will be similar to the examples done in class or the exercises assigned. When an assessment or assignment is graded, check it and understand your mistakes. Solutions will be available online: read them carefully and rewrite the questions that you did not answer properly.

One point of the course is to teach you to write clear mathematics, do quick and correct proofs, and present well-justified arguments. Therefore, except explicitly indicated, you should always show your work and explain what you are doing. This is a careful job that requires extensive training. For this reason, whenever you do an exercise (at home or in class), you should always write everything down, without using shortcuts, on a clean sheet of paper, as if it were a homework assignment. Not only will you test and hone your skills, but this will also help you memorize the material.

## Guidelines for tests and homework

**In-class tests**
No calculators (unless explicitly permitted by me), electronic devices, or any type of communication is allowed during in-class tests. During the exams, you will need to be connected to Zoom and have your camera on during the whole duration.

**Gradescope**
If you've never used Gradescope, please go to their website and watch the tutorial videos.
It is very easy and quick to make nice scans with your phone and a dedicated app. Check your app store to find one that you like. I have personally been satisfied with CamScanner. In all your written assignments, please abide by the following rules.
- Write your name (as on the roster) and NetID on the first page.
- Make a clean and clear scan of your assignments.
- Take photos in portrait mode.
- Turn all your photos in a single PDF file.
- When you upload this file, match each exercise with the corresponding pages.

**Late Work for Problem Sets**
For your first late assignment within 12 hours after the deadline (as indicated on Gradescope), no point deductions. All subsequent assignments submitted within 12 hours after the deadline will convert to a zero at the end of semester. In all cases, work submitted 12 hours or more after the deadline will not be accepted.

Quizzes due every Monday. All quizzes will not accept late assignments.

**Written Homework Guidelines**
Please see the guidelines on the cover of each HW assignment.

## About your instructor

I (Dr Yiping Lu) am a Courant Instructor at NYU. I'lll leave NYU after teaching linear algebra and join Northwestern University (Department of Industrial Engineering & Management Sciences). From 2019 to 2023, I was a Ph.D. student at Stanford University where I obtained my degree in Applied Mathematics, emphasis on Machine Learning (AI) and Numerical analysis (using computers to solve equations). Almost half of the idea behind my research is learnt from the linear algebra course. My research is about using AI to solve hard physic, industrial engineering and system management problems. Our department (IEMS) at Northwestern University is working on  how to make important decisions using data based on linear algebra and statistics.  My native language is Mandarin, and I also speak Japanese.

| | Due on Sundays | Monday | Wednesday | Friday | |
|---|---|---|---|---|---|
| | | Monday/Wednesday Sections | | | |
| 1/21/24 | | Lecture 1 | Lecture 1 - 2 | No Recitation | |
| 1/28/24 | | Lecture 2 | Lecture 2 - 3 | Recitation | |
| 2/4/24 | Quiz 1 | Lecture 3 | Lecture 4 | Recitation | Problem Set 1 Due |
| 2/11/24 | Quiz 2 | Lecture 5 | Lecture 5 - 6 | Recitation | |
| 2/18/24 | | No Class - President's Day | Lecture 6 - 7 | Recitation | Problem Set 2 Due |
| 2/25/24 | Quiz 3 | Lecture 7 | Lecture 8 - 9 | Recitation | |
| 3/3/24 | Quiz 4 | Lecture 10 | Lecture 11 | Recitation | Problem Set 3 Due |
| 3/10/24 | Quiz 5 | Lecture 12 | Midterm | No Recitation | |
| 3/17/24 | | Spring Break | | | |
| 3/24/24 | | Lecture 12 - 13 | Lecture 13 | Recitation | |
| 3/31/24 | Quiz 6 | Lecture 14 | Lecture 15 | Recitation | Problem Set 4 Due |
| 4/7/24 | Quiz 7 | Lecture 16 | Lecture 17 | Recitation | |
| 4/14/24 | Quiz 8 | Lecture 18 | Lecture 19 | Recitation | Problem Set 5 Due |
| 4/21/24 | Quiz 9 | Lecture 20 | Lecture 21 | Recitation | |
| 4/28/24 | Quiz 10 | Lecture 22 | Review | Recitation | Problem Set 6 |
| 5/5/24 | Quiz 11 | https://www.nyu.edu/students/student-information-and-resources/registration-records-and-graduation/final-exams-and-course-evaluations/final-exam-schedule.html | | | |