

MATH-UA 140: LINEAR ALGEBRA
SYLLABUS - FALL 2018

Instructor: Lisa B. Hartung, Courant Instructor

E-mail: lisa.hartung@nyu.edu

Office: Courant Institute (Warren Weaver Hall) Rm. 926

Office Hours: M 1:30-3:30

Lecture:

- BOBS Room:LL150 MW 9:00am-10.50am

Course description: Linear algebra is an area of mathematics devoted to the study of structure-preserving operators on special sets (linear operators on vector spaces). Linear algebra is a cornerstone of any mathematics curriculum for two very important (and related) reasons: 1) The theory of linear algebra is well understood and so a first step in many areas of applied mathematics is to reduce the problem into one in linear algebra. 2) The spaces and operations studied in the subject are commonplace in many different areas of mathematics, science, and engineering.

Over the semester we will study many topics that form a central part of the language of modern science. The successful student will be able to:

- Formulate, solve, apply, and interpret systems of linear equations in several variables;
- Compute with and classify matrices;
- Master the fundamental concepts of abstract vector spaces;
- Decompose linear transformations and analyze their spectra (eigenvectors and eigenvalues);
- Utilize length and orthogonality in each of the above contexts;
- Apply orthogonal projection to optimization (least-squares) problems;
- Explore other topics (as time permits).

The material we take up in this course has applications in physics, chemistry, biology, environmental science, astronomy, economics, statistics, and just about everything else. We want you to leave the course not only with computational ability, but with the ability to use these notions in their natural scientific contexts, and with an appreciation of their mathematical beauty and power.

Textbook:

- Strang, Gilbert. *Introduction to Linear Algebra*. 5th Edition.

Grading: The final grade will be computed with the following weights:

Homework	15%
Quizzes	10%
Midterm Exams	40%
Final Exam	35%

A note on grades of W and I.

You may drop the course in the first three weeks (by Monday, February 10) without it appearing on your transcript. After that, and through the ninth week, you may withdraw and receive a grade of 'W' on your transcript. No withdrawals are granted after the ninth week.

A grade of 'Incomplete' (I) is granted only in the rare circumstances that an emergency prevents a student in good standing from finishing the course in its last few weeks. As per the CAS Bulletin:

“Students who are ill or have a serious personal problem should see, call, or write to an adviser in the College Advising Center, College of Arts and Science, New York University, Silver Center, 100 Washington Square East, Room 905, New York, NY 10003-6688; 212-998-8130.”

NYU Classes: The chief means of communication for this course will be the course Classes site, accessed through newclasses.nyu.edu. Students are expected to check this for up-to-date assignments—including material separate from the text—and announcements.

Homework: Weekly problem sets with a mix of exercises from the text and supplementary problems will be collected. These include more in-depth problems requiring greater abstraction, understanding and/or synthesis of various concepts. In many ways, these constitute the heart of the course; rigor in their completion often yields the greatest understanding.

Quizzes: Short quizzes will be given every two weeks (see tentative schedule). These will generally cover material on the two previous week's homework. No make ups are given for Quizzes!

When calculating the homework and quiz grades for the semester, the lowest score in each of these areas will be dropped. **N.B.** It is advised that students reserve these "passes" for unexpected absences. In fairness to all students and graders, **late homework will not be accepted.**

Exams: There will be two in-class exams during the semester. See the attached schedule for likely dates.

Final Exam: Date not yet known!

Policy on out-of-sequence exams and missed quizzes

We are only able to accommodate a limited number of out-of-sequence exams due to limited availability of rooms and proctors. For this reason, we may approve out-of-sequence exams in the following cases:

- A documented medical excuse.
- A University sponsored event such as an athletic tournament, a play, or a musical performance. Athletic practices and rehearsals do not fall into this category. Please have your coach, conductor, or other faculty advisor contact your instructor.
- A religious holiday.
- Extreme hardship such as a family emergency.

We will **not** be able to accommodate out-of-sequence exams, quizzes, and finals for purposes of more convenient travel, including already purchased tickets. Please note again the date of the final and plan your summer travel accordingly.

Scheduled out-of-sequence exams and quizzes (those not arising from emergencies) must be taken before the actual exam. Makeups must occur within one week of the regularly scheduled exam or quiz, otherwise a zero score will be given.

If you require additional accommodations as determined by the Center for Student Disabilities, please let your instructor know as soon as possible.

Technology: Technology can play an important role in the learning of mathematics, and as such, graphing and scientific calculators are permitted for class and homework, though they will not be required. Calculators will not be permitted on tests and quizzes, and thus it is emphasized that students learn not to rely on them.

Academic Honesty: Guidelines regarding cheating and plagiarism are laid out in the [College of Arts and Sciences guidelines](#) and will be adhered to strictly. Collaboration is permitted, in fact encouraged, for home and class assignments; however, all submitted assignments must be written up independently and represent the student's own work and understanding.

Below is a proposed schedule for covering topics and assignments during the semester. All are subject to change as the semester progresses.

Day	M/W	Sections	Topic	Due	Note	
1	05.09.2018	§1.1-2	Introduction, Vectors			
2	10.09.2018	§1.3	Introduction Matrices			
3	12.09.2018	§2.1-2	Linear Systems/Elimination			
4	17.09.2018	§2.3-4	Matrix Operations		Q1	
5	19.09.2018	§2.5	Inverses	HW1		
6	24.09.2018	§2.6-7	PA=LU Factorization			
7	26.09.2018	§3.1	Vector Spaces	HW2		
8	01.10.2018	§3.2	Nullspace and Rank		Q2	
9	03.10.2018	§3.3	Complete Solutions	HW3		
10	09.10.2018	MIDTERM EXAM 1 (through 3.3)				
11	10.10.2018	§3.4	Independence/Dimension			
12	15.10.2018	§3.5-§4.1	The Four Subspaces			
13	17.10.2018	§4.2	Projections	HW4		
14	22.10.2018	§4.3	Projections/Least Squares			
15	24.10.2018	§4.4	Orthonormal Bases	HW5	Q3	
16	29.10.2018	§5.1	The Determinant			
17	31.10.2018	§5.2/3	Permutations, Cofactors, Volumes	HW 6		
18	05.11.2018	§6.1	Eigendinge			
19	07.11.2018	§6.2	Diagonalization	HW7	Q4	
20	12.11.2018	MIDTERM EXAM 2 (through 6.2)				
21	14.11.2018	§6.4-6.5	Symmetry and Similarity			
22	19.11.2018	§7.1	SVD			
23	26.11.2018	§8.1	Linear Transformations	HW 8		
24	28.11.2018	§8.2-8.3	Change of Basis			
25	03.12.2018				Q5	
26	05.12.2018			HW9		
27	10.12.2016	§9-§11	Applications/Select Topics/Revision			
28	12.12.2016			HW10(R evision)		
		FINAL EXAM				