MATH 140.001 - Linear Algebra

Fall 2020 Syllabus (*Last updated 12/7/20*)

Lecture	MW 8:00-9:15am	**Instructor**	Norman Cao
Classroom	ONLINE	**Email**	norman.cao@cims.nyu.edu
Text	*Introduction to Linear Algebra*	**Telephone**	NA
Author	Gilbert Strang	**Office**	ONLINE
Edition	5th edition	**Office Hours**	(refer to NYU Classes course page)

Objectives

Linear algebra is a cornerstone in any mathematics curriculum for two important reasons:

1) Because the theory of linear algebra is well understood, 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).

Course Communication

The syllabus, calendar, lecture notes, recitation worksheets, homework problem sets, homework solutions, previous exams, and any updates/announcements for this course will be communicated by email, on Campuswire, and/or posted to NYU Classes. **Solutions to recitation worksheets and previous exams will NOT be provided**.

Coursework

Lectures: All except for 7 lectures will be explained online via Zoom, and the sessions will be recorded and accessible throughout the semester. There are 7 lectures (lectures 4, 6, 9, 11, 15, 19, and 22) that will be taught asynchronously. You will be asked to watch videos for the asynchronous lectures, and to read sections in your book. Once you have completed a given asynchronous lecture, you will be asked to complete a quiz on the material you just learned. The quiz will be administered via Gradescope, and will be timed. These quizzes are open book, and you will be evaluated both based on content understanding and on using the notation from the book and video lecture. Lecture notes will be posted to NYU Classes after class meetings. Students are encouraged to read the assigned sections of the text before class and review class notes and examples soon after class.

Recitations: Recitation sessions are **mandatory** and will focus on solving problems related to the concepts explained during lecture. All recitations will be delivered via Zoom, and the sessions will be recorded for future access. **Please sign up to recitations that you are able to attend live**, as attendance will be taken and will count toward your **participation grade**. Recitation worksheets will be posted to NYU Classes before each recitation session.

Participation: Questions and discussions are encouraged. Students may participate by asking or answering questions during class (via Zoom), or asking and answering questions on the class site on Campuswire. Another component of participation will be attending recitations and working on problems with your fellow classmates. **Half of the participation grade will be based on online participation in lecture or Campuswire, and the other half on recitation attendance and participation.**

Online communication: This course requires you to set up a Gradescope account, through which all assignments and grading will be communicated. You have been added to Gradescope automatically, please be sure to follow the instructions in the email you received from Gradescope to set up your account.

Any course-related questions should be asked via our course site on Campuswire. **Please follow the link and enter the code 8611 to join our course**. Note that asking and answering questions can be done anonymously if you wish. It is encouraged to answer each other's questions, as that will promote a collaborative learning environment, and will add to your participation points. The teaching assistants and I will check your answers regularly, and add to them if needed.

Homework: Homework problem sets designed to expand and solidify concepts discussed in class will be posted to NYUClasses one week in advance of the due date. **All homework should be submitted via Gradescope. There will be a total of 10 assignments, and the lowest homework grade will be dropped**.

While students are encouraged to form online study groups and work together on homework outside of class time, homework write-ups must be written individually. It is advised that students begin assignments soon after topics are covered in lecture. Due dates are chosen to help students review the material discussed in a timely manner. In fairness to graders and other students in the course, late homework will not be accepted.

Exams and Quizzes: There are **weekly ten minute quizzes** on recitation days (Tuesdays and Thursdays), unless otherwise specified. **You will only need to complete the quiz corresponding to your recitation section**. These quizzes will be administered via Gradescope and will be **timed**. The quizzes will be released by midnight the previous day, and should be completed by **midnight that day**. If you decide to take both the Tuesday and Thursday quiz, and the two quizzes cover the same topics, then the higher of the two quiz grades will be kept.

Additionally, there are **7 timed asynchronous assessments**. These assessments will also be administered via Gradescope, and will be **due by midnight, one day after** the lecture dates shown on the course calendar below. The lowest assessment grade will be dropped.

There will be **two mid-semester exams**, one on **October 19** and another on **November 23**.
The final exam will be during final exam week (December 15-21) and is TBA. An excused absence for an exam requires notification to the instructor **before** the exam starts, followed by valid documentation. Otherwise, you will receive a "0" for any missed exams. Quizzes will be given during weekly recitations, and will be administered via Gradescope.
The lowest grade between the midterms and the final will be weighted 5%, while the two higher grades will be weighted 20%.

Grading Policy

Your course grade will be weighted and distributed as follows:

10% weekly quizzes	20% asynchronous assessments	15% HW	45% Midterms and Final	10% Participation

A	A-	B+	B	B-	C+	C	D	F
[100,91]	(91,88]	(88,85]	(85,80]	(80,77]	(77,73]	(73,65]	(65,50]	< 50

Grades will be posted to Gradescope and to NYU Classes.

Other Course Policies

I expect students to contribute to our positive learning environment: **try to attend live classes**, **pay attention** for the duration of the class, **participate** meaningfully during class by asking questions or answering them. Students who disrupt our learning environment will be asked to leave the Zoom session.

If you have questions related to the course, please ask them on Campuswire. If you need to send me an email, please include the course and section number you are enrolled in the subject of all email correspondence so that I may better assist you. I will normally reply within 24 hours. If I do not, please send me a reminder.

This course will abide by NYU CAS academic policies and honor code.

Resources

I am available during **office hours and by appointment** to review course material or address any course related concerns. Peer tutoring is available at University Learning Center and Undergraduate Mathematics Tutoring Center. Students seeking accommodations must consult the Moses Center for Student Accessibility.

MATH 140 - LINEAR ALGEBRA
FALL 2020 Monday-Wednesday Schedule

lecture	date	topic	sections
1	2-Sep	Vectors, dot product	§ 1.1,1.2
	7-Sep	Labor Day: NO CLASSES	
2	9-Sep	Matrices	§ 1.3
3	14-Sep	Linear systems/elimination	§ 2.1,2.2
4*	16-Sep	Matrix operations	§ 2.3,2.4
5	21-Sep	Inverses	§ 2.5
6*	23-Sep	P A = LU factorization	§ 2.6,2.7
7	28-Sep	Vector Spaces	§ 3.1
8	30-Sep	Nullspace	§ 3.2
9*	5-Oct	Complete solutions	§ 3.3
10	7-Oct	Independence/dimension	§ 3.4
11*	12-Oct	Four subspaces and orthogonality	§ 3.5,4.1
	14-Oct	Catch up and Review	Chapters 1-3
	19-Oct	EXAM 1	Chapters 1-3
12	21-Oct	Projections	§ 4.2
13	26-Oct	Least Squares	§ 4.3
14	28-Oct	Orthogonal basis	§ 4.4
15*	2-Nov	Determinants	§ 5.1, 5.2
16	4-Nov	Applications of determinants	§ 5.3
17	9-Nov	Eigenvalues	§ 6.1
18	11-Nov	Diagonalization	§ 6.2
19*	16-Nov	Symmetric/Positive Definite matrices	§ 6.4, 6.5
	18-Nov	Catch up and Review	Chapters 4-6
	23-Nov	EXAM 2	Chapters 4-6
20	25-Nov	Singular value decomposition (SVD)	§ 7.1,7.2
21	30-Nov	SVD/PCA (optional)	§ 7.3, 7.4
22	2-Dec	Linear transformations	§ 8.1, 8.2
23*	7-Dec	Change of basis	§ 8.2, 8.3
	9-Dec	Final Exam Review	Chapters 1-8

Last updated on 9/20/2020

* asynchronous assessment date: the course will only meet for 40 minutes on these days