

Linear Algebra for Applications

Math 547 Section 001

Summer 2020

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Office Hours: By appointment only

Course Meeting Time and Room: M-F 11:30am - 1:00pm Phillips 385

Course Information

Prerequisites: You must have earned a passing grade in MATH 233 (or an equivalent).

Text: *Linear Algebra and its Applications*, fifth edition, by Lay, Lay, and McDonald.

MyLabMath: The access code may be purchased using a credit card or in the UNC Textbook store. You can also bundle with a physical copy of the textbook (See options below). You must purchase an access code and enroll online in order to view and submit homework assignments. The Course ID is **conte14516**. More specific instructions for registration can be found on Sakai under Resources.

Textbook Options

1. MyLabMath that comes with an e-book version (this is less expensive)
2. Hardback Textbook + MyLabMath (this is more expensive but potentially a good investment depending on your field. I still have this book from when I took this class; the theorems are still numbered the same from back then!)

Sakai: All handouts, solutions and other class material will be posted on Sakai which can be accessed by going to: <https://sakai.unc.edu/portal>

Gradescope: Exams, written homework and worksheets will be done here. For each assignment, you will be able to submit photo's of your (neat) written work to each question. Your graded work and our comments will also be returned here.

Mathematica: Mathematica is a high level programming tool that is useful for computations and visualizations. I will require it for this course since I will use it in lecture and would like you to learn some basic numerical computations in this class. It is free through UNC's Software Acquisition here: <http://sa.unc.edu/shop>

Course Content: This course serves as an introduction to Linear Algebra. Linear Algebra is central in all of mathematics and the sciences, and is applicable to almost all fields of study. Throughout the term, we will develop the central tools of Linear Algebra (namely, vector spaces and matrices) and their applications. Throughout, specific examples and applications of Linear Algebra to the other sciences might be indicated or explored.

You are strongly encouraged to ask questions throughout this course — to me, the TA, and to each other. The more you are engaged in the material, the more beneficial this class will be. Group study is highly recommended. Throughout the term, you should be reading along in the textbook, reviewing your notes, and working problems beyond what are assigned in the homework to get a better grasp of the material and to be better prepared for both lectures and the exams.

Course Structure

Lectures: I will not hold lecture during the prescribed time. I will prerecord all lectures and post them during the weekend (probably Saturday). You can find them on Sakai under the Warpwire tab. It is **your responsibility** to make sure you are on track, watching the videos by the prescribed days (see the schedule on the last page).

Small Group: Videos cannot replace human interaction so we will meet in small groups **everyday** on Zoom. (Not on exam days.) Small group will occur at 12:00pm-12:30pm during what would be normal lecture time.

Meeting Link: <https://unc.zoom.us/j/93482240751?pwd=eGtkZ21ZQUxPYlltTnJnN2sxM0hJZz09>

Meeting ID: 934 8224 0751

Password:

There is a second small group time at 5:30pm-6:00pm for those who couldn't make it during regular class. If you need to switch times, please email me!

When we meet I expect you to:

1. have watched the day's lecture(s)
2. be ready to complete the day's worksheet which will be based on the lecture(s)

During this time, you may ask questions about the day's lecture(s). After questions, there will be a worksheet corresponding to the lecture. I will break you into small groups and expect you to talk amongst yourselves to do the worksheet. You won't be sitting next to each other but you aren't alone; take advantage of the platform I am providing to make some math friends. :)

Online Platforms: I will use three online platforms for this course.

1. Sakai - I will post videos, assignments, solutions, study guides, etc here.
2. MyLabMath - online homework assignments typically due 4 days after lecture is assigned.
3. Gradescope - exams and written homework will be due here. It allows you to upload your written work for each question and allows us to easily split up grading and give helpful feedback.

Tips: Set a schedule for yourself for each day. Why? Getting behind is too easy!! Do something akin to:

1. 10-11 am: Watch today's lecture(s)
2. 11:00-12:00am: Attempt the first couple MyLabMath problems while eating lunch to highlight what you do or don't understand.
3. 12:00-12:30am: Attend small group
4. 7-9pm: Continue the homework assignment that corresponds to today's lecture.
5. 9pm: Binge YouTube

Why?

- Watching the lecture close to Small Group will make the information fresh so you're ready to go and you can remember your questions
- Attempting problems before Small Group reveals weak spots you might not know you have
- I'm guessing you have other things to do so homework falls at the end of the day
- Trying to master that day's topic before day's end will set you up to understand the next day's lesson
- Find a time to quit or you won't sleep!

Of course, this may not work exactly for you, but find something that does and stick to it!

Expectations

Lectures: You are expected to keep up with the lectures (schedule is below). Do not binge watch, your brains can only hold so much. Do not be a spectator, you learn much better by doing. **Take notes** like you would in class. This will prepare you for Small Group plus, the exams are open note; don't shoot yourself in the foot.

Small Group: Small Group will be my version of attendance. You are expected to come everyday. You will not be able to do the day's worksheet if you do not. I only get 30 face to face minutes with you each day. We will begin Small group promptly to use our time as effectively as possible, thus you should be on time and prepared to start. If you need to leave early, let me know in advance. You are only allowed two unexcused absences. There are no Small Groups on exam days.

Office Hours: 30 minutes a day may not be enough. Please schedule office hours with me when you need additional help!

Honor Code Statement: Each student is expected to abide by the Honor Code and the Student Code of Conduct. <http://honor.unc.edu>

In this class, all exams must be done **individually**. It is an instance of cheating to give or receive help on an exam, except from the instructor. On homework assignments, students are encouraged to work together in pairs or small groups, provided that all participants are contributing and the collaboration benefits the learning of all involved. Simply copying or trading answers is an instance of cheating.

Assignments and Grading

Homework: Homework will primarily be submitted online through MyLabMath. These will be assigned daily throughout the semester. It is **your responsibility** to keep up with posted assignments and their due dates. You may submit late homework on MyLabMath anytime before July 26th for 70% credit. More information about registering for MyLabMath can be found on the Sakai site under Resources.

There will also be weekly written assignments in (addition to MyLabMath) that will be submitted on Gradescope. These will be announced in class and posted on Sakai.

You are encouraged to work collaboratively on all assignments; however, each student is responsible for their own. You may not use an online problem-solving service for graded work.

Worksheets: You will only be able to gain access to these by coming to Small Group. They are locked unless you come to small group and get the password. The goal is to hold you accountable to watching the lectures in a timely fashion and let me know if you know understood the content.

Exams: Exams will be administered via Gradescope. They will be available to take at any time on exam day but are **due by 11pm**. There is a time limit so make sure you are ready before opening the exam. You will need:

- Plenty of battery
- Clean paper and functional writing instruments
- Your book and notes

There will be two midterms, each lasting 2 hours. This should be enough time to complete the exam and upload it to Gradescope. Exams will be **open book** and **open notes**; internet is permitted if you want. However, **you are expected to work individually!** No use of other persons, classmate or otherwise, will be permitted. The content will be more theoretical than computation intensive to make sure *you* are passing my class and not Google. Computation questions will be graded on your work and not the answer; make sure you provide enough details to obtain full credit. Midterm dates are below:

- Exam 1: Monday, July 6
- Exam 2: Monday, July 20

There will be no make-up exams, except for religious and university-sponsored exceptions. You will not need a blue book or scantron.

The **comprehensive Final Exam** will be on **Monday, July 27**. The final exam is given in compliance with UNC's final exam regulations and calendar. In order to take a make-up exam after this date, you must have an official examination excuse, signed by a Dean or authorized agent of the Dean. You must email this excuse before the regularly scheduled exam.

Late Work: No late tests or make-up tests will be given. Students who need to miss a test for a UNC athletic team event, UNC academic field trip, or religious holiday can take the test in absentia or in advance with at least a week advance notice and written documentation. Exceptions will be made only in extreme circumstances with intervention from the Dean of Students' office. Students can complete online homework assignments late in MyLabMath for a penalty of 30%. Any portion of a MyLabMath assignment completed before the deadline will receive full credit, only answers submitted after the deadline will be penalized. **Late written homework or late worksheets will not be accepted.**

Grade Calculation:

MyLabMath	15%
Written Homework	15%
Worksheets	7%
Exam 1	15%
Exam 2	15%
Final Exam	33%

Course Grade:

92-100	A	77-79	C+
90-92	A-	73-76	C
87-89	B+	70-72	C-
83-87	B	67-69	D+
80-82	B-	60-66	D
		0-59	F

There are no grades of D- or A+.

There are no extra credit opportunities.

Resources

Office Hours: You are strongly encouraged to come to office hours. This is the best way to get one-on-one help with any concepts or exercises, as well as to get more in-depth knowledge of the material.

Classmates: I strongly encourage you to collaborate with your classmates on your homework. Study groups are what got me through college, so I highly suggest you do the same.

Math Help Center: (<http://math.unc.edu/undergraduate/math-help-center/>).

The Math Department sponsors free tutoring in the Math Help Center in 273 Phillips Hall. Please see the website for hours of operation. Any changes will be posted at <http://math.unc.edu/for-undergrads/help-center> and on the door of the room.

Paid Tutors: The Math Department keeps a list of paid tutors in the main office in Phillips 329 and on the Math Department website.

Tentative Schedule

Week	Date	Section	Topic
1	6/22	1.1, 1.2	Linear systems and Echelon Form
	6/23	1.3, 1.4	Vectors and Span, Matrix Multiplication, $A\vec{x} = \vec{b}$
	6/24	1.5, 1.7	Matrix Equations, Solutions Sets
	6/25	1.8, 1.9	Linear Transformations
	6/26		Mathematica Introduction
2	6/29	2.1	Matrix Algebra
	6/30	2.2, 2.3	Inverse Matrices, Invertible Matrix Theorem
	7/01	2.8	Subspaces of \mathbb{R}^n
	7/02	2.9	Bases, Dimension, Rank Nullity
	7/03	<i>No class</i>	<i>July 4th (Optional review session will be held.)</i>
3	7/06	Exam 1	Sections: 1.1, 1.2, 1.3, 1.4, 1.7, 1.8, 1.9, 2.1, 2.2, 2.3, 2.8, 2.9
	7/07	3.1	Determinants
	7/08	3.2	Properties of Determinants
	7/09	5.1	Eigenvalues
	7/10	5.2, 5.5	Characteristic Polynomial, Complex Eigenvalues
4	7/13	5.3	Similarity and Diagonalization
	7/14	6.1	Inner Product, Orthogonality
	7/15	6.2, 6.3	Orthogonal Sets, Projection
	7/16	6.4	Gram-Schmidt, Orthonormal Bases
	7/17		Review
5	7/20	Exam 2	Sections: 3.1, 3.2, 3.3, 5.1, 5.2, 5.5, 6.1, 6.2, 6.3, 6.4
	7/21	6.5	Least-Squares Problems
	7/22	7.1	Spectral Theorem
	7/23		Review
	7/24	<i>No class</i>	<i>Reading Day</i>
6	7/27	FINAL	Monday, July 27 from 11:30am - 2:30pm

Disclaimer: The instructor reserves the right to make changes to the syllabus, including due dates and test dates. Changes to MyLabMath due dates can be found on the MyLabMath site. Other changes will be announced in class or via Sakai.