Linear Algebra with Applications
Math 272, Spring 2017

Meeting Times and Location:
Lecture: MWF 10:00-10:50am
Discussion: Th 9:00-9:50am
Classroom: SMUD 206

Professor: Yusra Naqvi
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Office Phone: (413) 542-5712
Office Hours: M 2:00-3:00pm, WF 9:00-9:50am, Th 1:30-2:20pm, and *by appointment*

Math 272 Fellow: Shelly Tang

Prerequisites: MATH 121 or equivalent Intermediate Calculus course

Textbook: *Introduction to Linear Algebra with Applications* by Jim DeFranza and Daniel Gagliardi, published by Waveland Press (ISBN: 978-1-4786-2777-7) or McGraw-Hill (ISBN: 978-0-07-353235-6), 2009.

Course Webpage: http://ynaqvi.people.amherst.edu/math272sp17/

Course topics: This course involves the study of vector spaces over the real and complex numbers, introducing the concepts of subspace, linear independence, basis, and dimension; systems of linear equations and their solution by Gauss-Jordan elimination; matrix operations; linear transformations and their representations by matrices; eigenvalues and eigenvectors; and inner product spaces. We will also examine various applications of these concepts, using techniques such as LU decomposition, covariance matrices, least squares, and the singular value decomposition.

Homework: Homework will be assigned twice a week and will take on a variety of formats, such as readings, written solutions to problems, Mathematica labs, and presentations. Refer to the course website for assignments and their due dates. Written homework must be handed in at the beginning of the class in which they are due, and late homework will not be accepted for grading. Submitted work should be neat, organized, and stapled, with your name appearing on every sheet. Where appropriate, please box or highlight your final answer.

While you are strongly encouraged to work on written problem sets in groups, all submitted assignments must consist only of your own work, *written in your own words*. If you work with other students or with a tutor, you should include a note at the top of your homework saying who you worked with.

You may also talk with others about strategies for solving a problem in Mathematica, but please do not share files except with your lab partner. Sending or receiving a copy of a Mathematica file that contains student work will be treated as plagiarism.

You are required to read the relevant sections from the texbook that we cover each day. It is also important to look at homework problems for each class before the start of the next class in order to keep up with the class effectively. The best way to understand mathematics is to solve a lot of problems!

Absences: You are expected to attend every class and arrive on time for class. An absence due to emergency may be excused, provided that you can supply acceptable written evidence if required, and that you notify me *as soon as possible*. Two late arrivals will be treated as an absence. Students with more than four unexcused absences may have their grade lowered by one step (for example, a B- may be lowered to a C+).

Exams: There will be two in-class midterm exams and a three-hour cumulative final exam. All exams must be taken at the scheduled time. Make-up exams will only be allowed if you can supply *acceptable* written evidence, and that you notify me *before the end of the missed exam*. The midterm exams are tentatively scheduled as follows:

Midterm Exam 1: Wednesday, March 1
Midterm Exam 2: Monday, April 3

The final exam will be scheduled by the registrar at some point during the semester.

Grading: The overall grade will be based on the results of exams, the scores on homework, and on class participation, which will be measured in various ways, including attendence, participation in group work, in-class assignments and short quizzes. It will be determined using the following point distribution:

Homework & Class Participation	30%
Midterm Exams	25% for your better one, 15% for the other
Final Exam	30%

About the Statement of Intellectual Responsibilty: While you are strongly encouraged to work on homework problems in groups, the work you write up and hand in must be your own. If you receive help from an outside source, please include a note in your homework specifying what this was. Sharing a Mathematica file that contains student work with anyone other than your lab partner is a violation of the honor code and will be treated as plagiarism. For exams, you are not permitted to work with other students or use any additional aids such as calculators, notes, formula sheets, etc.

If you are unsure about whether something is allowed or not, please speak with me, and I would be happy to clarify.

Failure to comply with the above guidelines on homework or a midterm will result in a 0 for the assignment. Cheating on the final exam will result in an F for the course. All incidences will be reported to your class dean.

Course Outline: The following plan for the course is tentative and may be subject to change.

Week	Dates	Sections	Topics
1	1/23-1/27	1.1	Systems of linear equations
		1.2	Matrices and Gauss-Jordan elimination
2	1/30-2/3	1.3	Matrix operations
		1.4-1.5	Matrix inverses
		1.6	Determinants
3	2/6-2/10	1.7	Elementary matrices
		2.1	Vectors in $\mathbb{R}^n$
		2.2-2.3	Linear combinations and linear independence
4	2/13-2/17	3.1	Abstract vector spaces
		3.2	Important subspaces
5	2/20-2/24	3.3	Basis and dimension
		3.4	Coordinates and change of basis
5	W 3/1		**MIDTERM EXAM #1**
6	3/2-3/3	4.1-4.2	Linear transformations
		4.4	Matrix representations
		4.3	Isomorphisms
7	3/6-3/10	4.5	Similarity
		5.1	Eigenvalues and eigenvectors
		5.2	Diagonalization
8	3/22-3/24	5.4	Markov Chains
			Google PageRank
9	3/27-3/31	6.1-6.2	Inner products
		6.3	Orthonormal bases
10	M 4/3		**MIDTERM EXAM #2**
10	4/5-4/7	6.4	Projection and orthogonal complements
		6.5	Least squares approximation
11	4/10-4/14	6.6	Symmetric matrices
			Adjacency matrices for graphs
12	4/17-4/21	6.7	Quadratic forms
		6.8	Singular value decomposition
13	4/24-4/28		Linear programming