



## Shanghai Jiao Tong University

### MA081 Linear Algebra

<b>Instructor:</b>	Linghai Zhang	<b>Email:</b>	<a href="mailto:liz5@lehigh.edu">liz5@lehigh.edu</a>
<b>Instructor's Home Institution:</b>	Lehigh University	<b>Office:</b>	TBD
<b>Office Hours:</b>	TBD		
<b>Term:</b>	May 27-June 27, 2019	<b>Credits:</b>	4 units
<b>Classroom:</b>	TBD	<b>Teaching Assistant(s):</b>	TBD
<b>Class Hours:</b>	Monday through Thursday, 120 mins per teaching day		
<b>Discussion Sessions:</b>	2 hours each week, conducted by teaching assistant(s)		
<b>Total Contact Hours:</b>	66 contact hours (1 contact hour = 45 mins, 3000 mins in total)		
<b>Required Texts (with ISBN):</b>	Linear Algebra and Its Applications, Fourth Edition (kindle ebook), by David C. Lay. ISBN-13: 978-0-321-38517-8		
<b>Prerequisite:</b>	Calculus 1		



## Course Overview

The general topics we will cover in this class are systems of linear equations, matrix algebra, and vector spaces. There are many models of biological, economical, or physical systems which are quite complicated mathematically. No matter what the model, though, it is frequently approximated by a linear system in practice. The unifying theme of this class is to study such linear systems from various points of view (algebraically, computationally, and geometrically).

## Learning Outcomes

Students should be able to express a linear system in the form of matrix equations and vector equations and solve them. Know the basic properties and operations of matrices. Understand the definitions of determinants and know their computation and applications of determinants. Understand basis and dimension of vector spaces. Understand subspaces related to a matrix and rank of a matrix. Understand the meaning of eigenvalues and eigenvectors of a matrix and use them to diagonalize a matrix. Know the orthogonal sets and projections and solve least-square problems. Understand how to diagonalize a symmetric matrix and deal with quadratic forms.

## Grading Policy

Homework and quizze	30%
Midterm exam	30%
Final exam	40%

Grading Scale is as follows:

Number grade	Letter grade	GPA
90-100	A	4
85-89	A-	3.7
80-84	B+	3.3
75-79	B	3
70-74	B-	2.7
67-69	C+	2.3
65-66	C	2
62-64	C-	1.7
60-61	D	1
≤59	F (Failure)	0



**Class Schedule (Subject to Change)**

Day	Lecture	Chapter
Day 1	Linear systems and row reduction	1.1-1.2
Day 2	Vector equation, matrix equation and solutions	1.3-1.5
Day 3	Linear independence	1.5-1.7
Day 4	Linear transformation	1.8-1.9
Day 5	Matrix operations and inverse of a matrix	2.1-2.2
Day 6	Invertible matrices, matrix partition and factorization	2.3-2.5
Day 7	Determinants	3.1-3.2
Day 8	Cramer's rule, vector spaces	3.3, 4.1
Day 9	Midterm review	
Day 10	Midterm exam	
Day 11	Null spaces and column spaces	4.2-4.3
Day 12	Coordinate system and change of basis	4.4,4.7
Day 13	Dimension and rank	4.5-4.6
Day 14	Eigenvalue and eigenvectors	5.1-5.2
Day 15	Diagonalization, Inner product, orthogonality	5.3-6.1
Day 16	Orthogonal sets and projections	6.2-6.3
Day 17	Gram-Schmidt process, least-square problems and application to linear models	6.4-6.6
Day 18	Symmetric matrices and quadratic forms	7.1-7.2
Day 19	Final review	
Day 20	Final Exam	



**Homework Assignment (all from textbook)**

Section 1.1: 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27.

Section 1.2: 1, 3, 5, 7, 9, 11, 13, 17, 21, 23.

Section 1.3: 5, 9, 11, 13, 21.

Section 1.4: 1, 3, 5, 7, 9, 11, 13, 15, 21, 25, 23, 29.

Section 1.5: 7, 9, 11, 13, 17, 21, 23, 27, 35.

Section 1.7: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21.

Section 1.8: 1, 3, 5, 7, 9, 11, 17, 19, 21, 29, 31, 33.

Section 1.9: 1, 3, 5, 7, 9, 11, 15, 17, 19, 21, 23.

Section 2.1: 5, 7, 9, 11, 13, 15, 17, 23, 25, 31.

Section 2.2: 1, 3, 5, 9, 11, 13, 15, 17, 19, 29, 31, 33, 35.

Section 2.3: 1, 3, 5, 11, 13, 15, 17. Section 2.4: 1, 3, 5,  
7, 9, 11, 13, 25 Section 2.5: 7, 9, 11, 13, 15.

Section 3.1: 1, 5, 7, 9, 11, 13.

Section 3.2: 1, 3, 9, 5, 7, 11, 15, 17, 19, 21, 25, 29, 31, 33, 35, 39.

Section 3.3: 1, 7, 9.

Section 4.1: 1, 3, 5, 7, 9, 11, 15, 17, 21, 23.

Section 4.2: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 23, 25, 31.

Section 4.3: 1, 3, 5, 7, 9, 13, 15, 23, 33.

Section 4.4: 1, 3, 5, 7, 9, 11, 13, 19, 25, 27, 29.

Section 4.5: 1, 3, 7, 9, 11, 13, 15, 17, 19, 27.

Section 4.6: 1, 3, 5, 7, 9, 11, 13, 15, 17.

Section 4.7: 1, 5, 7, 9.

Section 5.1: 1, 3, 5, 7, 11, 13, 15, 17, 21, 23, 25, 27.

Section 5.2: 1, 3, 5, 9, 11, 15, 17, 21.

Section 5.3: 1, 5, 7, 9, 11, 13, 17, 21, 23, 27.

Section 6.1: 1, 3, 5, 7, 9, 15, 17, 19, 27, 31.

Section 6.2: 1, 3, 7, 11, 17, 23, 29.

Section 6.3: 1, 3, 5, 7, 13, 15, 21. Section

6.4: 1, 3, 5, 9, 17.

Section 6.5: 1-13(odd)

Section 7.1: 1,3,5, 8, 10, 13, 17, 19, 25, 29

Section 7.2: 1,5,8,11,13, 19, 21, 27