



## MA077 Linear Algebra

<b>Instructor Information</b>	<p>Chao Liu          Home Institution: Shanghai University of Finance &amp; Economics          Email: Liu.chao@shufe.edu.cn          Office Hours: Determined by Instructor</p>		
<b>Term</b>	<p>June 27, 2022          - July 22, 2022</p>	<b>Credits</b>	4 units
<b>Class Hours</b>	Monday through Friday, 120 mins per teaching day		
<b>Discussion Sessions</b>	2.5 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>	<p>Linear Algebra and Its Applications, Fourth Edition (kindle ebook), by David C. Lay. ISBN-13: 978-0-321-38517-8</p>		
<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).

## Course Goals

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

Quizzes and Homework	30%
Midterm Examination	30%
Final Examination	40%

## Grading Scale

Number grade	Letter grade	GPA
90-100	A	4.0
85-89	A-	3.7
80-84	B+	3.3
75-79	B	3.0
70-74	B-	2.7
67-69	C+	2.3
65-66	C	2.0
62-64	C-	1.7
60-61	D	1.0
≤59	F (Failure)	0



### Class Schedule

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