Shanghai Jiao Tong University

MA077 Linear Algebra

Term: May 29 – June 23, 2017
Instructor: Gexin Yu
Home Institution: College of William and Mary
Email: gyu@wm.edu
Class Hours: Monday through Friday, 120 minutes each day
Discussion session: 2.5 hours each week
Total Contact Hours: 66 contact hours (45 minutes each, 3000 minutes in total)
Credit: 4 units

Course Goals

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).

Required Text

Linear Algebra and Its Applications, Fourth Edition (kindle ebook), by David C. Lay. ISBN-13: 978-0-321-38517-8

Course Policy

Homework: Homework problems will be assigned for each section we cover, but will not be collected or graded.
Quizzes: We will have two quizzes every week (only one in the weeks with exams). Quiz problems are taken from homework problems. No make-up quiz will be given. Your lowest quiz grade will be dropped.
Exam: There will be one midterm exam, tentatively scheduled for June 14. There will also be a comprehensive final exam at the end of our session. Please tell me as soon as possible if you have a conflict.
Calculator: You may use calculator for homework problems, but no calculator is allowed in quizzes or exams.
Grading Policy

✧ Homework and quizzes: 30%
✧ Midterm exam: 30%

✧ Final exam: 40%

Your letter grade will be assigned according the following 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

Course Schedules

WEEK ONE (May 29 – June 3):
Section
1.1 Systems of Linear Equations
1.2 Row Reduction and Echelon Forms
1.3 Vector Equations
1.4 The Matrix Equation Ax=b
1.5 Solution Sets of Linear Systems
1.7 Linear Independence
1.8 Introduction to Linear Transformations
1.9 The Matrix of a Linear Transformation
2.1 Matrix Operations

WEEK TWO (June 5 – June 9):
Section
2.2 The Inverse of a Matrix
2.3 Characterizations of Invertible Matrices
2.4 Partitioned Matrices
2.5 Matrix Factorizations
3.1 Introduction to Determinants
3.2 Properties of Determinants
3.3 Cramer's Rule, Volume, and Linear Transformations
Exam at the end of the week.

WEEK THREE (June 12 – June 16):
Section
4.1 Vector Spaces and Subspaces
4.2 Null Spaces, Column Spaces, and Linear Transformations
4.3 Linearly Independent Sets; Bases
4.4 Coordinate Systems
4.5 The Dimension of a Vector Space
4.6 Rank
4.7 Change of Basis
5.1 Eigenvectors and Eigenvalues
5.2 The Characteristic Equation
5.3 Diagonalization
5.4 Eigenvectors and Linear Transformations

WEEK FOUR (June 19 – June 22):
Section
6.1 Inner Product, Length, and Orthogonality
6.2 Orthogonal Sets
6.3 Orthogonal Projections
6.4 The Gram-Schmidt Process
6.5 Least-Squares Problems
6.6 Applications to Linear Models
7.1 Diagonalization of Symmetric Matrices
7.2 Quadratic Forms
7.3 Constrained Optimization
Final exam at the end of the week

Academic Honesty

The highest standards of academic integrity are enforced for this course. You may (actually are encouraged to) work together on your homework problems, but you are allowed to get help on your quizzes or exams from your classmates or any other resources. Failure to abide the rule will result in a failing grade for your coursework.

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 5.4: 1, 3, 5, 9, 19, 21, 23, 25.
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 65: 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
Section 7.3: 1,3,5,7,11