



MA077 Linear Algebra

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| Instructor Information | Chao Liu Home Institution: Shanghai Jiao Tong University Email: Liu.chao@shufe.edu.cn Office Hours: Determined by Instructor | | |
| Term | December 13, 2021 - January 7, 2022 | Credits | 4 units |
| Class Hours | Monday through Friday, 120 mins per teaching day | | |
| Discussion Sessions | 2.5 hours each week, conducted by teaching assistant(s) | | |
| Total Contact Hours | 66 contact hours (1 contact hour = 45 mins, 3000 mins in total) | | |
| Required Texts (with ISBN) | Linear Algebra with Applications, Ninth Edition, by Steven J. Leon. ISBN-13: 978-0-321-96221-8 | | |
| Prerequisite | 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

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| 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, row reduction | Chapter 1.1-1.2 |
| Day 2 | Matrix arithmetic | Chapter 1.3 |
| Day 3 | Matrix inversion, the transposes of a Matrix | Chapter 1.4 |
| Day 4 | Elementary matrices, partitioned matrices | Chapter 1.5-1.6 |
| Day 5 | Determinants, | Chapter 2.1 |
| Day 6 | Properties of determinants, Cramer's rule | Chapter 2.2-2.3 |
| Day 7 | Definition of vector spaces, subspaces | Chapter 3.1-3.2 |
| Day 8 | Midterm review | |
| Day 9 | Midterm Exam | |
| Day 10 | Linear independence | Chapter 3.3 |
| Day 11 | Basis and dimension | Chapters 3.4 |
| Day 12 | Change of basis, row space and column space | Chapter 3.5-3.6 |
| Day 13 | Linear transformations | Chapter 4.1 |
| Day 14 | Matrix representations of linear transformations, similarity | Chapter 4.2-4.3 |
| Day 15 | The scalar product in R^n , orthogonality in R^n | Chapter 5.1-5.2 |
| Day 16 | Least-square problems, inner product spaces, | Chapter 5.3-5.4 |
| Day 17 | Orthonormal sets, the Gram-Schmidt orthogonalization process | Chapter 5.5-5.6 |
| Day 18 | Eigenvalue and eigenvectors | Chapter 6.1 |
| Day 19 | Final review | |
| Day 20 | Final Exam | |

* Fee-paying (non-exchange) program held by School of Continuing Education, SJTU.

* 此课程由上海交通大学继续教育学院开设，所提供课程不包括在上海交通大学与海外高校校级合作的学分互认范畴之内。