



August 2011

MATH 206 Linear Algebra I

1. Catalog Description

MATH 206 Linear Algebra I (4)

Matrices, inverses, linear systems, determinants, eigenvalues, eigenvectors, vector spaces, linear transformations, applications. 4 lectures. Prerequisite: MATH 143 or consent of instructor.

2. Required Background or Experience

Math 143 or consent of instructor.

3. Learning Objectives

After successfully completing this course, the student should possess a working knowledge of the following:

- a. The concept of matrices and their role in linear algebra and applied mathematics.
- b. A complete understanding of linear systems $Ax = b$, and the role of rank, subspace, linear independence, etc. in the analysis of these systems.
- c. Eigenvalues and eigenvectors of matrices and their computation.
- d. The concept of determinant and its properties.
- e. The concepts of vector space and linear maps when the vector space is \mathbf{R}^n .
- f. The role of decomposition of matrices such as $A = LU$ or $A = QR$ in solving linear systems or least squares approximations.
- g. Important definitions in linear algebra and the ability to do very elementary proofs.
- h. Re-emphasize the concept and precise definition of a function and give specific examples within the context of this particular course.

4. Text and References

Lay, David C., Linear Algebra and its Applications, 3rd ed., Addison-Wesley, 2003
Bretscher, Otto, Linear Algebra with Applications, 3rd ed., Prentice-Hall, 2004

5. Minimum Student Materials

Paper, pencils, and notebook. A calculator with the capability to do matrix manipulation is recommended for applications.

6. Minimum University Facilities

Classroom with ample chalkboard space for class use. Use of a computer lab is optional.

7. Content and Method

The following outline is based on the *Linear Algebra Curriculum Study Group Recommendations* for a first course in linear algebra. For a detailed description of these recommendations, see the January 1993 issue of *The College Mathematics Journal* or the course supervisor. The sections listed are for Lay's 3rd edition. It is easy to go too slowly in chapter one. Overheads are available for examples of systems of linear equations.

<u>Topics</u>	<u>Lessons</u>
Sections 1.1 – 1.9 Systems of linear equations	8
Sections 2.1 – 2.4 Matrix and vector operations, factorizations	4-5
Sections 2.8 – 2.9 Properties of \mathbf{R}^n (linear combinations, bases, spanning set, dimensions, dimension equation)	4-6
Section 4.4 Coordinate systems and change of basis	2
Sections 3.1 – 3.3 Determinants	2-3
Sections 5.1 – 5.3 Eigenvalues and eigenvectors	3-5
Sections 6.1 – 6.3 Orthogonality (orthogonal projections, Gram-Schmidt orthogonalization, QR factorizations)	3-5
Section 7.1 Diagonalization of symmetric matrices	1-2
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Total	27-36

Recommended Supplementary Topics

If time permits, more applications, such as 1.10, 2.6, 2.7, 4.9, 5.6. Do not cover abstract vector spaces in depth; this will cause too much overlap with Math 306.

Method

Lecture, classroom discussion, and computer projects at discretion of instructor. Include proofs at appropriate levels in lectures, homework, and/or discussion .

8. Methods of Assessment

Assigned problem sets, scheduled examinations, and possibly computer projects.