



September 2008

MATH 306 Linear Algebra II

1. Catalog Description

MATH 306 Linear Algebra II (4)

Inner product spaces, orthogonality, Fourier series and orthogonal bases, linear transformations and similarity, eigenvalues and diagonalization. 4 lectures. Prerequisite: MATH 241, and MATH 206 or MATH 244, and a C- or better in MATH 248, or consent of instructor.

2. Required Background or Experience

Math 206 and Math 242, or Math 241 and Math 244, and a C- or better in Math 248.

3. Learning Objectives

The student should learn the language and methods of linear algebra and some of the most important applications. Abstract vector spaces, including spaces of functions, should be included to illustrate the concepts. The methods include computations with pencil and paper and with computers.

4. Text and References

Instructor chooses text in consultation with the course supervisor. Recommendations include:

Axler, Sheldon, Linear Algebra Done Right, 2nd ed., Springer-Verlag, 1997.

Friedberg, Stephen et al., Linear Algebra, 4th ed., Prentice-Hall, 2002.

Lewis, David, Matrix Theory, World Scientific, 1991.

Meyer, Carl, Matrix Analysis and Applied Linear Algebra, SIAM, 2001.

Supplemental computer software:

Matlab™

True BASIC™

Mathematica™

Theorist™

Maple™

HP-48 calculators

5. Minimum Student Materials

Paper, pencils, and notebook.

6. Minimum University Facilities

Classroom with ample chalkboard space for class use, and (optionally) computer lab.

7. Content and Method

Have students review Gaussian Elimination and other computational techniques on their own.

Vector spaces: include abstract definition, spaces of functions, spaces of linear transformations, and \mathbf{R}^n

Subspaces, linear independence, bases, and sums of subspaces (in abstract vector spaces)

Linear transformations and matrices on abstract vector spaces.

Determinants (brief review in more rigorous context than in Math 206)

Eigenvalues and eigenvectors of linear transformations

Diagonalization

Inner product spaces, orthonormal bases, Gram-Schmidt

Fourier series (*if time permits*)

Re-emphasize the concept and precise definition of a function and give specific examples within the context of this particular course

Note: It may not be possible to reach the material on inner product spaces in Math 306. In that case, the material should be postponed until Math 406. The instructor will need to supplement the text for material on Fourier series. It is also possible to move the Fourier series to Math 406. See the course supervisor for ideas and information.

Some suggested chapter outlines to follow for Math 306 are: Using Axler, cover Chapters 1-5 or 6. You may need to skip some sub-sections to get through Chapter 6. Using Friedberg, Insel, and Spence, cover Chapters 1, 2, 4, 5, and possibly 6.1 and 6.2. Most of the topics in Chapter 3 are repeated from Math 206, so only changes in notation and enough material to illustrate additional abstraction should be covered.

8. Methods of Assessment

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