MATH 206  Linear Algebra I

1. Catalog Description

   MATH 206  Linear Algebra I  (4)

   Systems of linear equations. Matrix algebra, including inverses and determinants. Vectors, vector spaces, bases and linear transformations in real coordinate space of n dimensions. Eigenvalues, eigenvectors and diagonalization. Applications of linear algebra. Introduction to inner products and orthogonality. 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 $\mathbb{R}^n$.
   f. Important definitions in linear algebra and the ability to do very elementary proofs.
   g. 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
   Bretscher, Otto, Linear Algebra with Applications

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 4th edition. It is easy to go too slowly in chapter one. Overheads are available for examples of systems of linear equations.

<table>
<thead>
<tr>
<th>Topics</th>
<th>Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sections 1.1 – 1.9 Systems of linear equations</td>
<td>8-9</td>
</tr>
<tr>
<td>Sections 2.1 – 2.3 Matrix and vector operations</td>
<td>3-4</td>
</tr>
<tr>
<td>Sections 2.8 – 2.9 Properties of $\mathbb{R}^n$ (linear combinations, bases, spanning set, dimensions, dimension equation)</td>
<td>4-6</td>
</tr>
<tr>
<td>Section 4.4 Coordinate systems and change of basis</td>
<td>2</td>
</tr>
<tr>
<td>Sections 3.1 – 3.3 Determinants</td>
<td>2-3</td>
</tr>
<tr>
<td>Sections 5.1 – 5.3 Eigenvalues and eigenvectors</td>
<td>3-5</td>
</tr>
<tr>
<td>Sections 6.1 – 6.3 Orthogonality</td>
<td>3-5</td>
</tr>
<tr>
<td>Section 7.1 Diagonalization of symmetric matrices</td>
<td>1-2</td>
</tr>
</tbody>
</table>

**Total** 26-36

**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.