Course Outline  
Department of Mathematics and Statistics  
Minnesota State University

Math 247  **Linear Algebra I** (4 semester hours)

**Course Description:**
Matrices, determinant, systems of linear equations, vector spaces, linear transformations, and characteristic value problems.

*Prerequisites: MATH 122 with “C” (2.0) or better or consent*

**Learning Outcomes:**

Students will be able to:

1. Learn how to solve systems of linear equations using matrix representation;
2. Learn matrix operations and their properties;
3. Understand theoretical values of determinants of square matrices;
4. Understand the concepts of a vector space, and its bases and dimension as a measure of the complexity of the vector space;
5. Understand linear transformations and their matrix representations associated with bases;
6. Understand theoretical values of eigenvalues and eigenvectors for square matrices and learn their applications to dynamical systems and differential equations;
7. Understand inner products, orthogonality, the Gram-Schmidt process, and use these concepts to application problems such as least squares approximation;
8. Understand matrix decompositions and their applications to engineering and sciences such as image processing and Statistics;
9. Be able to communicate mathematics clearly and accurately in oral and written form;
10. Exhibit a positive attitude toward mathematics.

**Content Outline:**

1. Systems of Linear Equations
2. Matrix Algebra
3. Determinants
4. Vector Spaces and Linear Transformations
5. Eigenvalues and Eigenvectors
6. Diagonalization
7. Orthogonality and Least Squares

**Textbook/Related Readings/Materials:**

Lay, *Linear Algebra and its Applications*

Williams, *Linear Algebra with applications*
Anton, *Elementary Linear Algebra*
Holt, *Linear Algebra with Applications*
Olver & Shakiban, *Applied Linear Algebra*
Strang, *Introduction to Linear Algebra*