

## **Departmental Syllabus** **Math 3230 -- Linear Algebra**

**Textbook:** Linear Algebra and Its Applications (Third Edition - Update), by David C. Lay

**Prerequisites:** MATH 2740 with a grade of "C" or better

**Calculators:** Graphing calculator required; TI-83, 84, 85, or 86 recommended. (NOTE: On occasion, individual instructors may restrict the use of any type of calculator).

**Course Description:** Matrices, systems of equations, determinants, eigenvalues, eigenvectors, vector spaces, linear transformations, and diagonalization. This class is intended to introduce students to formal mathematics. Students will be expected to learn definitions, theorems, and proofs.

### **Topics and sections to be covered:**

#### Chapter 1 – Linear Equations in Linear Algebra

- 1.1 Systems of Linear Equations
- 1.2 Row Reduction and Echelon Forms
- 1.3 Vector Equations
- 1.4 The Matrix Equation  $Ax=b$
- 1.5 Solution Sets of Linear Systems
- 1.7 Linear Independence
- 1.8 Introduction to Linear Transformations
- 1.9 The Matrix of a Linear Transformation

#### Chapter 2 – Matrix Algebra

- 2.1 Matrix Operations
- 2.2 The Inverse of a Matrix
- 2.3 Characterizations of Invertible Matrices
- 2.8 Subspaces of  $R^n$
- 2.9 Dimension and Rank

#### Chapter 3 – Determinants

- 3.1 Introduction to Determinants
- 3.2 Properties of Determinants
- 3.3 Cramer's Rule, Volume, and Linear Transformations

#### Chapter 4 – Vector Spaces

- 4.1 Vector Spaces and Subspaces
- 4.2 Null Spaces, Column Spaces, and Linear Transformations

- 4.3 Linearly Independent Sets; Bases
- 4.4 Coordinate Systems
- 4.5 The Dimension of a Vector Space
- 4.6 Rank
- 4.7 Change of Basis

Chapter 5 – Eigenvalues and Eigenvectors

- 5.1 Eigenvectors and Eigenvalues
- 5.2 The Characteristic Equation
- 5.3 Diagonalization

Chapter 6 – Orthogonality and Least Squares

- 6.1 Inner Product, Length, and Orthogonality
- 6.2 Orthogonal Sets
- 6.3 Orthogonal Projections
- 6.4 The Gram-Schmidt Process
- 6.5 Least-Squares Problems