



COURSE SYLLABUS

Course: Linear Algebra
Number: MAT 4110
Credit-Hours: 4 Credits

Course Description: Topics covered include solutions of systems of linear equations, matrices, linear transformations, bases and linear independence, determinants, orthogonality, singular values, eigenvectors and eigenvalues, rank, geometric applications.

Prerequisite: MAT 2620 (Calculus II or equivalent)

Detailed Syllabus:

0. Getting Started

1. Email and Chat
2. Learning About the Course
3. Software Fundamentals

1. Vectors

1. Geometry of Vectors
2. Perpendicular Frames
3. Curves in 2D: Change of Frames/Basis
4. Dot Products
5. Cross Products
6. Ellipses and Ellipsoids
7. Area and Volume

2. Matrices

1. Basics
2. Transforming Curves
3. Matrix Arithmetic
4. Translations and Rotations
5. Shears
6. Linear Transformations
7. Inverses
8. Determinants
9. Transposes
10. Matrix Decomposition: SVD
11. Rank
12. Projections
13. Higher Dimensions

3. Linear Systems

1. Conversion to Matrix Notation
2. Gaussian Elimination
3. Vector Spaces and Subspaces
4. Numerical Considerations
5. Applications: Color Image Compression
6. Applications: Least Square Fit
7. Spanning Sets; Basis
8. Linear Independence

4. Eigenvalues and Eigenvectors

1. Diagonalization of a Matrix
2. Eigenvalues
3. Eigenvectors
4. Exponential of a Matrix
5. Applications to Dynamical Systems
6. Spectral Theorem
7. Pseudo Inverses

Additional Optional Topics:

5. Return to Calculus

1. Gradient Vectors
2. Hessians
3. Quadratic Forms
4. Function Spaces
5. Fourier Approximation
6. Gram-Schmidt Process