

COURSE SYLLABUS

Course: Linear Algebra
Number: Math 335
Units: 4 Credits

Course Description: Elementary theory of abstract vector spaces. Topics include: Linear independence, bases, dimension, linear maps and matrices, determinants, orthogonality, eigenvectors and eigenvalues, spectral theorem, rank, geometric applications, function spaces.

Prerequisites: MATH 166 (Calculus II) or equivalent. [First year Calculus - Differential and Integral Calculus, Series/Approximation]

Detailed Syllabus:

0. Getting Started

1. Email and Chat
2. Learning About the Course
3. Fundamentals of LiveMath Maker and/or Mathematica

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
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

5. Return to Calculus

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

