

Math 307

Outline

Linear Equations (8 hours)

Topics: Solving linear equations, vector and matrix norms, condition number.

Applications: Lagrange interpolation, splines, finite difference approximation.

Subspaces, Basis and Dimension (8 hours)

Topics: Vector spaces, subspaces, basis, dimension, basis for $N(A)$, $R(A)$, $N(A^T)$ and $R(A^T)$.

Applications: Formula matrix for a chemical system, Graphs and resistor networks.

Orthogonality (6 hours)

Topics: Orthonormal bases and orthogonal matrices, Complex vector spaces.

Applications: Least squares, Fourier series, discrete Fourier transforms.

Eigenvalues and Eigenvectors (12 hours)

Topics: Eigenvalues and eigenvectors, Hermitian matrices.

Applications: Effective resistance (revisited), Power method, Markov chains, Anderson tight binding model, Google PageRank, Singular Value Decomposition, Principal Co-ordinate analysis.