



Department of Mathematics  
Johns Hopkins University

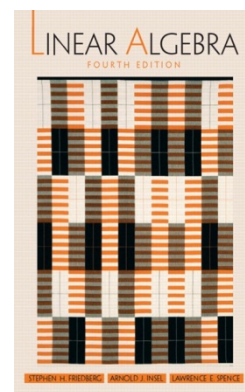
# 110.212 Honors Linear Algebra Course Syllabus

The following list of topics is considered the core content for the course 110.212 Honors Linear Algebra. The current text for the course is:

**Text:** [Linear Algebra](#), 4<sup>th</sup> Edition, Friedberg, S., Insel, A., and Spence, L., New Jersey: Pearson, November, 2002, ISBN-10: 0130084514, ISBN-13: 9780130084514.

## Course Topics

- **Vector Spaces (2 weeks)**
  - 1.1 Introduction
  - 1.2 Vector Spaces
  - 1.3 Subspaces
  - 1.4 Linear Combinations and Systems of Linear Equations
  - 1.5 Linear Dependence and Linear Independence
  - 1.6 Bases and Dimension
- **Linear Transformation and Matrices (2 weeks)**
  - 2.1 Linear Transformations, Null Spaces, and Ranges
  - 2.2 The Matrix Representation of a Linear Transformation
  - 2.3 Composition of Linear Transformations and Matrix Multiplication
  - 2.4 Invertibility and Isomorphisms
  - 2.5 The Change of Coordinate Matrix
  - 2.6 (optional) Dual Spaces
- **Elementary Matrix Operations and Systems of Equations (2- weeks)**
  - 3.1 Elementary Matrix Operations and Elementary Matrices
  - 3.2 The Rank of a Matrix and Matrix Inverses
  - 3.3 Systems of Linear Equations---Theoretical Aspects
  - 3.4 Systems of Linear Equations---Computational Aspects
- **Determinants (1 week)**
  - 4.1 Determinants of Order 2
  - 4.2 Determinants of order  $n$
  - 4.3 Properties of Determinants
  - 4.5 (optional) A Characterization of the Determinant
- **Diagonalization (2- weeks)**
  - 5.1 Eigenvalues and Eigenvectors
  - 5.2 Diagonalizability
  - 5.4 Invariant Subspaces and the Cayley-Hamilton Theorem





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- **Inner Product Spaces (2+ weeks)**
  - 6.1 Inner Products and Norms
  - 6.2 The Gram-Schmidt Orthogonalization Process and Orthogonal Complements
  - 6.3 The Adjoint of a Linear Operator
  - 6.4 Normal and Self-Adjoint Operators
  - 6.5 (optional) Unitary and Orthogonal Operators and Their Matrices
  - 6.6 (optional) Orthogonal Projections and the Spectral Theorem
  
- **Canonical Forms (1+ week)**
  - 7.1 Jordan Canonical Form I
  - 7.2 Jordan Canonical Form II