

Department of Mathematics
Johns Hopkins University

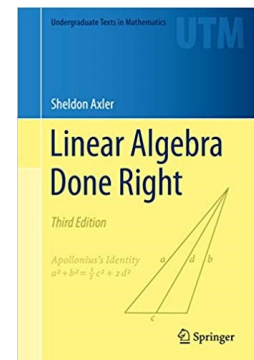
110.212 Honors Linear Algebra Course Syllabus

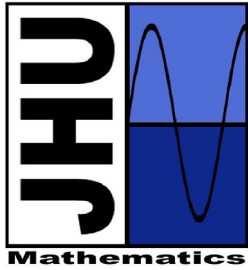
The following list of topics is considered the core content for the course 110.212 Honors Linear Algebra. The current text for the course is:

Text: [Linear Algebra Done Right](#), 3rd Edition, Axler, S., Springer: Undergraduate Texts in Mathematics, November 2014, ISBN-10: 3319110799, ISBN-13: 978-3319110790.

Course Topics

- **1. Vector Spaces (1 week)**
 - 1.A \mathbb{R}^n and \mathbb{C}^n
 - 1.B Definition of Vector Space
 - 1.C Subspaces
- **Finite Dimensional Vector Spaces (1 week)**
 - 2.A Span and Linear Independence
 - 2.B Bases
 - 2.C Dimension
- **Linear Maps (3 weeks)**
 - 3.A The Vector Space of Linear Maps
 - 3.B Null Spaces and Ranges
 - 3.C Matrices
 - 3.D Invertibility and Isomorphic Vector Spaces
 - 3.E Products and Quotients of Vector Spaces
 - 3.F Duality
- **Polynomials (1 week)**
- **Eigenvalues, Eigenvectors, and Invariant Subspaces (1 week)**
 - 5.A Invariant Subspaces
 - 5.B Eigenvalues and Upper-Triangular Matrices
 - 5.C Eigenspaces and Diagonal Matrices
- **Inner Product Spaces (1.5 weeks)**
 - 6.A Inner Products and Norms
 - 6.B Orthonormal Bases
 - 6.C Orthogonal Complements and Minimization Problems
- **Operators on Inner Product Spaces (1.5 weeks)**
 - 7.A Self-Adjoint and Normal Operators
 - 7.B The Spectral Theorem
 - 7.C Positive Operators and Isometries
 - 7.D Polar Decomposition and Singular Value Decomposition





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- **Operators on Complex Vector Spaces (2 weeks)**
 - 8.A Generalized Eigenvectors and Nilpotent Operators
 - 8.B Decomposition of an Operator
 - 8.C Characteristic and Minimal Polynomials
 - 8.D Jordan Form

- **Operators on Real Vector Spaces (1 week)**
 - 9.A Complexification
 - 9.B Operators on Real Inner Product Spaces