

MATH 4101: LINEAR ALGEBRA II (4 CREDITS)
COURSE INFORMATION

Course Textbook: Advanced Linear and Matrix Algebra (1st Edition), by Nathaniel Johnston, Published by Springer, ISBN-10:3030528146, ISBN-13:978-3030528140

Textbook Sections.

- 1.1 Vector Spaces and Subspaces
 - 1.1.1 Subspaces
 - 1.1.2 Spans, Linear Combinations, and Independence
 - 1.1.3 Bases
- 1.2 Coordinates and Linear Transformations
 - 1.2.1 Dimension and Coordinate Vectors
 - 1.2.2 Change of Basis
 - 1.2.3 Linear Transformations
 - 1.2.4 Properties of Linear Transformations
- A.1 Review of Introductory Linear Algebra
 - A.1.6 Eigenvalues and Eigenvectors
 - A.1.7 Diagonalization
- 1.3 Isomorphisms and Linear Forms
 - 1.3.1 Isomorphisms
 - 1.3.2 Linear Forms
 - 1.3.3 Bilinearity and Beyond
 - 1.3.4 Inner Products
- 1.4 Orthogonality and Adjoint
 - 1.4.1 Orthonormal Bases
 - 1.4.2 Adjoint Transformations
 - 1.4.3 Unitary Matrices
 - 1.4.4 Projections
- 2.1 The Schur and Spectral Decompositions
 - 2.1.1 Schur Triangularization
 - 2.1.2 Normal Matrices and the Complex Spectral Decomposition
 - 2.1.3 The Real Spectral Decomposition
- 2.2 Positive Semidefiniteness
 - 2.2.1 Characterizing Positive (semi) Definite matrices
 - 2.2.2 Diagonal Dominance and Gershgorin Discs
 - 2.2.3 Unitary Freedom and PSD Decompositions
- 2.3 The Singular Value Decomposition
 - 2.3.1 Geometric Interpretation and Fundamental Subspaces
 - 2.3.2 Relationship with Other Matrix Decompositions
- 2.C Applications of the SVD