

TKU211202

Linear Algebra

Aljabar Linear

BASIC INFORMATION

Course Credit	2 / 100 minutes per Week
Course Type	Required
Course Classification	Basic Science
Prerequisites	Vector and Matrix Theory

STUDENT AND LEARNING OUTCOMES

Covered Student Outcomes

Fundamental and Engineering Knowledge (KP.1) Engineering Design (KP.3)
Development of Engineering Solution (KP.2)

Learning Outcomes

- LO1** Students are able to explain the property of the determinant of a matrix, able to explain how to compute the determinant of a matrix, able to apply determinant to solve inverse problems and system of linear equations.
- LO2** Students are able to explain the concepts of eigenvalues, eigenvectors, and singular value decompositions (SVD), able to explain how to compute eigenvalue decomposition of a square matrix and the SVD of a matrix.
- LO3** Students are able to understand the concept of linear transformation and translate this into matrix language.

COURSE DESCRIPTION

This course is the continuation of Vector and Matrix Theory. It mostly deals with determinant and eigenvalue problem of a matrix.

TOPICS

1. Determinants

- 1.1 The properties of determinant
- 1.2 Permutation and cofactors
- 1.3 Cramer's rule, inverse, and volumes

2. Eigenvalues and Eigenvectors

- 2.1 Eigenvalue problem
- 2.2 Eigenvalue decomposition and diagonalization
- 2.3 Eigenvalue and eigenvectors for solving systems of differential equations

3. Symmetric matrices

- 3.1 Diagonalization of symmetric matrices
- 3.2 Positive definite matrices
- 3.3 Symmetric matrices in optimization

4. Singular value decomposition (SVD)

- 4.1 SVD motivation
- 4.2 SVD problem
- 4.3 Geometry of SVD
- 4.4 SVD for symmetric matrices

5. Linear transformations

- 5.1 The idea of linear transformation
- 5.2 Linear transformations in matrix language
- 5.3 Finding good basis

6. Complex vectors and matrices

- 6.1 Complex number
- 6.2 Hermitian and unitary

REFERENCES

- [1] Strang, G. (2009). Introduction to Linear Algebra (4ed). Cambridge:Wellesley Cambridge Press.
- [2] Poole, D. (2006). Linear Algebra: A Modern Introduction (2ed). Pacific Grove: Brooks-Cole Publishing.
- [3] Strang, G. (2006). LinearAlgebra and its Applications (4ed).Cambridge: Wellesley Cambridge Press.