MATH A235: APPLIED LINEAR ALGEBRA

Item	Value
Curriculum Committee Approval Date	12/04/2024
Top Code	170100 - Mathematics, General
Units	3 Total Units
Hours	54 Total Hours (Lecture Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Open Entry/Open Exit	No
Grading Policy	Standard Letter (S), • Pass/No Pass (B)
Associate Arts Local General Education (GE)	• Area 1B Communication and Analytical Thinking (OA2)
Associate Science Local General Education (GE)	• Area 1B Communication and Analytical Thinking (OAS2) • Area 2 Mathematical Concepts and Quantitative Reasoning (OMTH)
California General Education Transfer Curriculum (Cal-GETC)	• Cal-GETC 2A Math Concepts (2A)
Intersegmental General Education Transfer Curriculum (IGETC)	• IGETC 2A Math Concepts (2A)
California State University General Education Breadth (CSU GE-Breadth)	• CSU B4 Math/Quant.Reasoning (B4)

Course Description

Introduction to linear algebra, classical linear algebra problems, and applications to computer science and related technologies including matrices, determinants, linear spaces, linear transformations, and eigenvalues. PREREQUISITE: MATH A185 or MATH A185H or MATH A182H or Appropriate OCC Math placement. Transfer Credit: CSU; UC.

Course Level Student Learning Outcome(s)

1. Apply the theory and techniques of linear algebra in applications from physics, operations research and other scientific disciplines.
2. Solve linear systems, including under- and over-determined systems.
3. Relate linear transformations to their matrices with respect to given bases.
4. Describe linear transformations as functions mapping an n-dimensional space to an m-dimensional space.

Course Objectives

- 1. Apply matrix methods to systems of linear equations
- 2. Use bases and orthonormal bases to solve problems in linear algebra
- 3. Find the dimension of spaces such as those associated with matrices and linear transformations
- 4. Apply determinant methods to matrices and systems of equations
- 5. Describe the properties of Rn
- 6. Find eigenvalues and eigenvectors and use them in applications
- 7. Prove basic results in linear algebra about independence of vectors, properties of subspaces, linearity, injectivity and surjectivity of functions, and properties of eigenvectors and eigenvalues
- 8. Use linear algebra techniques and theory to solve selected applications

Lecture Content

Basic Matrix Theory matrix operations and their properties matrix transpose special matrices diagonal triangular symmetric trace of a matrix Solve Systems of Linear Equations Using Matrix Methods Gaussian and Gauss-Jordan elimination row reduction using elementary matrices calculating inverse matrices and usign them to solve systems of equations Determinants elementary properties cofactor expansion determinants and row operations detAB=(detaA)(detB) Cramer's Rule Rn and other Real Vector Spaces definition of a vector space subspaces linear combinations linear independence and dependence spanning set basis dimension Matrix Generated Spaces row space column space null space rank nullity Linear Transformations definition of a linear transformation nullspace (kernel) and range nullity and rank rank-nullity theorem injectivity and surjectivity inverse linear transformation matrix representations of linear transformations change of basis matrix Inner Product dot product definition of an inner product space norm orthogonal and orthonormal vectors angle between vectors orthogonal and orthonormal sets and bases Graham-Schmidt Process Eigenvalues and Eigenvectors definition of eigenvalues and eigenvectors characteristic polynomial algebraic multiplicity of eigenvalues eigenspaces, geometrix multiplicity diagnoalization includin g orthogonal diagonalization of symmetric matrices Applications such as least squares regression analysis, stochastic matrices, and the use of technology as it relates to linear algebra

Method(s) of Instruction

- Lecture (02)

Instructional Techniques

Lecture, discussion, written homework.

Reading Assignments

As assigned from text. 1 hour

Writing Assignments

Writing is encouraged throughout the course but is not necessarily a part of the grading or exams. 1 hour

Out-of-class Assignments

As assigned by instructor. 4 hour

Demonstration of Critical Thinking

Several written tests and a comprehensive final.

Required Writing, Problem Solving, Skills Demonstration

Several written tests and a comprehensive final.

Eligible Disciplines

Mathematics: Master's degree in mathematics or applied mathematics OR bachelor's degree in either of the above AND master's degree in statistics, physics, or mathematics education OR the equivalent. Master's degree required.

Textbooks Resources

1. Required Larson, Ron. . Elementary Linear Algebra. , 8th ed. Boston: Cengage Learning, 2017 Rationale: -

Other Resources

1. Other appropriate textbook as chosen by faculty.