MATH 0034 - INTRODUCTION TO LINEAR ALGEBRA

Catalog Description

Prerequisite: Completion of Math 0030 with grade of "C" or better
Advisory: Completion of Math 0031 with grade of "C" or better strongly recommended
Hours: 54 lecture
Description: Develops the techniques and theory needed to solve and classify systems of linear equations. Solution techniques include row operations, Gaussian elimination, and matrix algebra. Investigates the properties of vectors in two and three dimensions, leading to the notion of an abstract vector space. Vector space and matrix theory are presented including topics such as inner products, norms, orthogonality, eigenvalues, eigenspaces, and linear transformations. Selected applications of linear algebra are included. (CSU)

Course Student Learning Outcomes

- CSLO #1: Utilize theorems from linear algebra and use matrices to solve systems of equations,and to classify sets and mappings.
- CSLO #2: Present clear, complete, accurate, and sufficiently detailed solutions to communicate reasoning and demonstrate the method of solving problems.
- CSLO #3: Prove basic results in linear algebra using appropriate proof-writing techniques.

Effective Term

Fall 2026

Course Type

Credit - Degree-applicable

Contact Hours

54

Outside of Class Hours

108

Total Student Learning Hours

162

Course Objectives

Upon successful completion of the course, students will be able to:

1. Find solutions of systems of equations using various methods appropriate to lower division linear algebra;
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. Find eigenvalues and eigenvectors and use them in applications; and
5. Prove basic results in linear algebra using appropriate proof-writing techniques such as linear independence of vectors; properties of subspaces; linearity, injectivity and surjectivity of functions; and properties of eigenvectors and eigenvalues.

General Education Information

- Approved College Associate Degree GE Applicability
  - AA/AS - Mathematical Concepts and Quantitative Reasoning
- CSU GE Applicability (Recommended-requires CSU approval)
- Cal-GETC Applicability (Recommended - Requires External Approval)
  - Cal-GETC 2 - Mathematical Concepts
- IGETC Applicability (Recommended-requires CSU/UC approval)

Articulation Information

- CSU Transferable
- UC Transferable

Methods of Evaluation

- Problem Solving Examinations
  - Example: Prove that P3 is a vector space by verifying that the set P3 satisfies each of the axioms for a vector space. This problem is graded for completeness and accuracy. Students need to verify each of the ten vector space axioms.
- Reports
  - Example: In a report, give specific examples of 5 different types of lattices and prove the corresponding bases for each of your examples. In a summary, compare your proofs performed with lattices with the proofs for bases you performed with vector spaces and explain how they are similar and different. This report is graded on completeness, and accuracy of the proofs. The student will also be graded on their summary and their analytical comparison of the proofs in the two mathematical structures.

Repeatable

No

Methods of Instruction

- Lecture/Discussion

Lecture:

1. The students and instructor will engage in an interactive discussion concerning whether P3 with certain restrictions constitutes a vector space. The discussion will lead to a conclusion that prompts the instructor to introduce the writing technique necessary for students to verify that such a set is a vector space or introduce the writing technique necessary for students to verify such a set is not a vector space. Students will then get an opportunity to practice such writing techniques on other sets provided by the instructor.

Typical Out of Class Assignments
Reading Assignments

Read from the text and research a mathematical structure similar to a vector space called a lattice. Be prepared to discuss your findings in class.

Writing, Problem Solving or Performance

Consider the linear transformation T: R3 to R defined by the inner product of v with a fixed nonzero vector u, also in R3. Find Ker(T) and interpret this geometrically. Find Rng(T), and the dimensions of both Ker(T) and Rng(T).

Other (Term projects, research papers, portfolios, etc.)

Required Materials

- Linear Algebra
  - Author: Waldron, Cherney, and Denton
  - Publisher: Libre Texts
  - Publication Date: 2025
  - Text Edition:
  - Classic Textbook?: No
  - OER Link:
  - OER: https://math.libretexts.org/Bookshelves/Linear_Algebra/Map%3A_Linear_Algebra_(Waldron_Cherney_and_Denton)
- Introduction to Linear Algebra
  - Author: Gilbert Strang
  - Publisher: Wellesey-Cambridge Press
  - Publication Date: 2023
  - Text Edition: 6th
  - Classic Textbook?: No
  - OER Link:
  - OER:

Other materials and-or supplies required of students that contribute to the cost of the course.