

University of Arkansas – Fort Smith
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General Syllabus

MATH 30803 Applied Linear Algebra

Credit Hours: 3 Lecture Hours: 3 Laboratory Hours: 0

Prerequisite: MATH 24004 Calculus I or MATH 280H4 Calculus I (Honors)

Effective Catalog: 2020~2021

I. Course Information

A. Catalog Description

Systems of linear equations, vector spaces, linear transformations, matrices, and determinants.

II. Student Learning Outcomes

A. Subject Matter

Upon completion of this course, the student will be able to:

1. Perform basic matrix operations of addition, scalar multiplication, multiplication, determinant, and inversion.
2. Solve systems of linear equations using Gaussian elimination, Cramer's rule, and inverse matrices.
3. Determine the linear dependence or independence of a set of vectors in $\mathbb{R}^n$
4. Determine a basis for a subspace of $\mathbb{R}^n$.
5. Find the eigenvalues and eigenvectors of a matrix.

B. University Learning Outcomes

This course enhances student abilities in the following areas:

Analytical Skills

Quantitative Reasoning: Students will use concepts of linear algebra to solve application problems in multiple disciplines.

Communication Skills (written and oral)

Students will compose coherent documents describing real-world linear algebra problems and solution strategies.

Ethical Decision Making

Students will identify ethical dilemmas wherever present in real-world linear algebra applications and apply ethical frameworks to resolve such dilemmas.

III. Major Course Topics

- A. Matrix operations
 - 1. Matrix notation and matrix multiplications
 - 2. Matrix operation
 - 3. The inverse of a matrix
 - 4. Characterizations of invertible matrices
- B. Determinants and inverse matrices
 - 1. Determinations
 - 2. Inverse matrices
 - 3. Transposes matrices
- C. Systems of equations
 - 1. Homogeneous system
 - 2. Solving systems of linear equations
 - 3. Subspaces and bases
- D. n-dimensional Euclidean space
 - 1. Vector spaces and subspaces
 - 2. Null space, column space, and linear transformations
 - 3. Linearly independent
 - 4. The dimension of a vector space
- E. Eigenvalues and eigenvectors
 - 1. Eigenvalues and eigenvectors
 - 2. The characteristics equation
 - 3. Diagonalization
 - 4. Eigenvectors and linear transformations