SECTION HEADING

MATH 2210: Linear Algebra

Description

Linear Algebra introduces systems of matrix linear equations, linear transformations, matrix operations, vector spaces, eigenvalues and eigenvectors, orthogonality, and applications.

Credits

4

Prerequisite

MATH 1122

Corequisite

None

Topics to be Covered

1. Linear Equations in Linear Algebra

2. Matrix Algebra

3. Determinants

4. Vector Spaces

5. Eigenvalues and Eigenvectors

6. Orthogonality and Least Squares

7. Symmetric Matrices and Quadratic Forms

8. Applications

9. Numerical Linear Algebra

Learning Outcomes

1. Solve systems of linear equations using matrix methods including Gaussian Elimination, Gauss-Jordan Elimination, and by matrix equation representation.

2. Perform operations on matrices including addition, subtraction, multiplication, transposition, and inversion.

3. Identify symmetric, skew-symmetric, lower triangular, upper triangular, triangular, scalar, and diagonal matrices and apply their basic properties.

4. Create and recognize row equivalent matrices and equal matrices.

5. Write LU and elementary matrix factorizations of square matrices where defined.

6. Interpret the determinant of a matrix and its properties, and apply them to linear independence, areas, volumes, orientation, invertibility, Cramer's Rule, and the adjoint of a matrix.

7. Identify a vector space from the axioms and prove that a non-empty subset of a vector space is a subspace.

8. Prove or disprove that a given finite set of vectors is linearly independent

9. Determine whether a vector is in the span of a finite collection of vectors.

10. Create a basis for a nonzero finite dimensional vector space and find its dimension.

11. Compute the coordinate vector of a vector relative to a finite basis.

12. Construct bases for the row, column and null space of a matrix. Relate their dimensions to one another, and to the rank and nullity of the matrix.

13. Express the solution to AX = B as a translation of the null space of A when AX = B is consistent.

14. Construct matrix representations for linear transformations relative to various bases when the domain and codomain are finite dimensional over the same field, and create change of basis matrices.

15. Evaluate inner products, construct and identify orthogonal sets of vectors and orthogonal matrices, and illustrate the Gram-Schmidt process.

16. Compute, explain, and apply key properties and definitions related to eigenvalues and eigenvectors of a matrix.

Credit Details

Lecture: 4

Lab: 0

OJT: 0

MnTC Goal Area(s): Goal Area 04- Mathematics/Logical Reasoning

Minnesota Transfer Curriculum Goal Area(s) and Competencies

Goal Area 04: Mathematics/Logical Reasoning is already met by the pre-requisite course MATH 1121