North Hennepin Community College

MATH 2300: Linear Algebra

A. COURSE DESCRIPTION

Credits: 4

Lecture Hours/Week: 0

Lab Hours/Week: 0

OJT Hours/Week: *.*

Prerequisites:
This course requires any of these three prerequisites
A score of 3 on test Adv Placement Calculus BC
MATH 1222 - Calculus II (Minimum grade: 1.67 GPA Equivalent)
MATH 2220 - Calculus III (Minimum grade: 1.67 GPA Equivalent)

Corequisites: None

MnTC Goals: Goal 04 - Mathematical/Logical Reasoning

This course includes vectors and vector spaces, matrices, matrix algebra, linear systems of equations, determinants, linear transformations, eigenvalues and eigenvectors. Students will also be expected to construct proofs relating to linear dependence and/or independence, the span of a set of vectors, and whether a set of vectors satisfies the vector space axioms.

B. COURSE EFFECTIVE DATES: 08/27/1997 - Present

C. OUTLINE OF MAJOR CONTENT AREAS

1. See Course Description and Course Outcomes

D. LEARNING OUTCOMES (General)

1. Solve systems of linear equations using matrix methods including Gaussian Elimination, Gauss-Jordan Elimination, and by matrix equation representation. (MnTC Goal 4: a, b, d; Goal 2: a, c), (NHCC ELO 1,2);
2. Perform operations on matrices including addition, subtraction, multiplication, transposition, and inversion. (MnTC Goal 4: a)
3. Identify symmetric, skew-symmetric, lower triangular, upper triangular, triangular, scalar, and diagonal matrices and apply their basic properties. (MnTC Goal 4: a)
4. Create and recognize row equivalent matrices and equal matrices. (MnTC Goal 4: a)
5. Write LU and elementary matrix factorizations of square matrices where defined. (MnTC Goal 4: a, d; Goal 2: c, d) (NHCC ELO 2)
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. (MnTC Goal 4: a, d; Goal 2: b, c, d) (NHCC ELO 1, 2, 4)
7. Identify a vector space from the axioms, and prove that a non-empty subset of a vector space is a subspace. (MnTC Goal 4: a, b, c; Goal 2: a, c, d) (NHCC ELO 2, 4)
8. Prove or disprove that a given finite set of vectors is linearly independent. (MnTC Goal 4: a, b, c; Goal 2: a, c, d) (NHCC ELO 2, 4)
9. Determine whether a vector is in the span of a finite collection of vectors. (MnTC Goal 4: b, c; Goal 2: a, b, c, d) (NHCC ELO 2, 4)
10. Create a basis for a nonzero finite dimensional vector space and find its dimension. (MnTC Goal 4: a, b, d) (NHCC ELO 2)
11. Compute the coordinate vector of a vector relative to a finite basis. (MnTC Goal 4: a, b, d) (NHCC ELO 2)
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. (MnTC Goal 4: a, b, d) (NHCC ELO 2)
13. Express the solution to Ax = b as a translation of the null space of A when Ax = b is consistent. (MnTC Goal 4: a)
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. (MnTC Goal 4: a, b, d) (NHCC ELO 2)
15. Evaluate inner products, construct and identify orthogonal sets of vectors and orthogonal matrices, and illustrate the Gram-Schmidt process. (MnTC Goal 4: a, b, d) (NHCC ELO 2)
16. Compute, explain, and apply key properties and definitions related to eigenvalues and eigenvectors of a matrix. (MnTC Goal 4: a, b, d) (NHCC ELO 1, 2, 4)

E. Minnesota Transfer Curriculum Goal Area(s) and Competencies

Goal 04 - Mathematical/Logical Reasoning

1. Illustrate historical and contemporary applications of mathematical/logical systems.
2. Clearly express mathematical/logical ideas in writing.
3. Explain what constitutes a valid mathematical/logical argument(proof).
4. Apply higher-order problem-solving and/or modeling strategies.

F. LEARNER OUTCOMES ASSESSMENT

As noted on course syllabus

G. SPECIAL INFORMATION

None noted