Miami Dade College

Course Description
MAS2103 | Elementary Linear Algebra | 3.00 Credits
This course introduces students to linear algebra and its applications. Topics include linear systems of equations, matrices, determinants, vector spaces, inner product spaces, linear transformations, linear independence and basis, eigenvalues and eigenvectors, decomposition theorems, and elements of proof writing. Computational course.

Course Competencies:
Competency 1: The student will solve linear systems of equations by:
1. Applying elementary row operations to the system
2. Applying Gauss-Jordan elimination

Competency 2: The student will demonstrate proficiency in Matrix Algebra by:
1. Performing matrix addition, scalar multiplication, and matrix multiplication
2. Finding the transpose, the cofactor, and the adjoint matrices of a given matrix
3. Finding the inverse of an invertible matrix by either the formula or applying row operations
4. Solving linear systems applying matrix algebra

Competency 3: The student will demonstrate proficiency in Determinants Theory by:
1. Evaluating determinants by either row reduction or cofactor expansion
2. Applying the properties of the determinants for solving problems

Competency 4: The student will demonstrate knowledge of vector spaces and their properties by:
1. Performing basic operations in a vector space
2. Determining if a subset of a vector space is a subspace of a vector space
3. Recognizing the Euclidean norm, distance, and inner product
4. Determining if a set of vectors is linearly independent
5. Finding the basis for a vector space
6. Finding an orthonormal basis for a vector space by applying the Gram-Schmidt process

Competency 5: The student will demonstrate knowledge of linear transformations by: Calculating the kernel and the range of a linear transformation.
1. Finding a matrix representation of a given linear transformation
2. Describing the geometric properties of basic linear transformations in the plane

Competency 6: The student will demonstrate knowledge of eigenvalues and eigenvectors by:
1. Defining eigenvalues and eigenvectors of a matrix and a linear transformation
2. Finding eigenvalues and eigenspaces of a matrix
3. Recognizing the differences between algebraic multiplicity and geometric multiplicity of an eigenvalue

Competency 7: The student will demonstrate knowledge of abstract spaces by:
1. Performing vector operations in spaces such as space of continuous functions, space of polynomials functions, and space of matrices
2. Finding basis and coordinate vectors in abstract spaces

Learning Outcomes:
- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Formulate strategies to locate, evaluate, and apply information