# Miami-Dade Community College
## MAS 2103 Elementary Linear Algebra

<u>Course Description</u>   Topics include:  Vector spaces; linear independence and bases; systems of linear equations; linear transformations; matrices; rank and nullity; eigenvalues and eigenvectors. (3 hrs. lecture)

<u>Pre-requisite</u>:  MAC 2311 with a grade of C or better or equivalent.

<u>Course Competencies</u>:

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| **Competency 1:** | The Student will solve linear systems of equations by: |
| | a.  Applying elementary row operations to the system, |
| | b.  Applying Gauss-Jordan elimination. |

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

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| **Competency 3:** | The Student will demonstrate proficiency in Determinants Theory by: |
| | a.  Evaluating determinants by either row reduction or cofactor expansion, |
| | b.  Applying the properties of the determinants for solving problems. |

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| **Competency 4:** | The Student will demonstrate knowledge of the Euclidean n-th space $E^n$ and its properties by: |
| | a.  Performing basic operations in |
| | b.  Determining if a subset of $E^n$ is a subspace of $E^n$ |
| | c.  Recognizing the Euclidean norm, distance, and inner product, |
| | d.  Determining if a set of vectors is linearly independent, |
| | e.  Finding basis for $E^n$ |
| | f.  Finding orthonormal basis for $E^n$ applying the Gram Schmidt process. |

| Competency 5: | The Student will recognize linear transformations between $E^n$ and $E^m$ and: |
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      a.      Calculate the kernel and the range of a linear transformation,

      b.      Find a matrix representation of a given linear transformation,

      c.      Describe the geometric properties of basic linear transformations in the plane.

| Competency 6: | The Student will demonstrate knowledge of eigenvalues and eigenvectors by: |
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      a.      Defining eigenvalues eigenvectors of a matrix and a linear transformation,

      b.      Finding eigenvalues and eigenspaces of a matrix,

      c.      Recognizing the differences between algebraic multiplicity and geometric multiplicity of an eigenvalue.

| Competency 7: | The Student will demonstrate knowledge of abstract spaces by |
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      a.      Performing vector operations in spaces such as space of continuous functions, space of polynomials functions, and space of matrices,

      b.      Finding basis and coordinate vectors in abstract spaces.