BROWARD COLLEGE
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Course Outline

Course Title: Linear Algebra
Common Course Title: MAS2103
Effective Term: Fall 2020 (Aug 9, 2020)
Credit Hours: 3 Units

Next Review : Aug 8, 2025
Contact Hour Breakdown: *(Per 16 week Term)*
Total: 48
Lecture:
Lab:
Clinic:
Other:

Requirements

Pre-requisite(s) with minimum grade required
MAC1114 (C) *AND* MAC1140 (C)
OR
MAC1147 (C)

Course Description:

A first course in linear algebra, emphasizing the algebra of matrices and vector spaces. Recommended for students majoring in mathematics or related areas. Recommendation of the Mathematics Department or at least a grade of "C" in each of the prerequisite courses is required.

Course Outline

UNITS

Unit 1: Matrices and Systems of Equations

General Outcome
1.0 Use matrix operations and other procedures in finding the solutions of homogeneous and nonhomogeneous systems of linear equations and apply these procedures to the study of vector spaces.;

Specific Learning Outcomes
1.1 Solve systems of homogeneous and nonhomogeneous linear equations by the elimination method and by the reduction of the augmented matrix of the system.
1.2 Determine criteria for the existence and uniqueness of solutions.
1.3 Perform vector operations and apply vector methods to the solution of problems.
1.4 Evaluate the determinant of a matrix.
1.5 Perform matrix operations, find the inverse of a square matrix when the inverse exists, and solve matrix equations.

Unit 2: Vector Spaces

General Outcome
2.0 Develop an understanding of the concept of a vector space, prove that a mathematical system is a vector space, and determine its dimension.;

Specific Learning Outcomes
2.1 Define a vector space.
2.2 Determine whether a particular set is linearly independent.
2.3 Determine whether a subset of a vector space spans the vector space.

2.4 Determine whether a subset of a vector space is a basis for the vector space.
2.5 Determine the coordinates of a vector with respect to a basis.
2.6 Identify subspaces of a vector space.
2.7 Determine the dimension of a vector space and of its subspaces.
2.8 Find the rank and nullity of a matrix.
2.9 Find the dot product of two vectors.
2.10 Define orthogonal and orthonormal sets and find orthogonal bases for vector spaces.
2.11 Apply these concepts in the solution of problems.

Unit 3: Transformations and Matrices

General Outcome
3.0 Demonstrate an understanding of the definition of linear transformation, identify linear transformations, and apply matrix methods to linear transformations.;

Specific Learning Outcomes
3.1 Define a linear transformation.
3.2 Identify projections, rotations, and reflections.
3.3 Find the matrix of a linear transformation.
3.4 Find product transformations.
3.5 Apply the rules of transformation multiplication.
3.6 Make use of the relationship between matrix and transformation.
3.7 Apply these concepts to geometric situations.

Unit 4: The Inverse of a Linear Transformation

General Outcome
4.0 Determine when a linear transformation is invertible, how to find the inverse, and how to relate the theory of invertibility to coordinate changes.;

Specific Learning Outcomes
4.1 Determine if the inverse of a matrix exists.
4.2 Find the inverse of a matrix using row reduction.
4.3 Find the inverse of a product of matrices.
4.4 Find the transpose of a matrix.
4.5 Determine if a matrix is orthogonal.
4.6 Find the inverse of a linear transformation.
4.7 Describe transformations of rotations, reflections, and projections.
4.8 Use an invertible matrix to find the coordinates of a vector relative to a basis when given the coordinates of the vector relative to a different basis.
4.9 State and use the properties of determinants to evaluate large (m x m) determinants.
4.10 State the relationships between the inverse of a matrix and its determinant.
4.11 Find the adjoint of a matrix.
4.12 Find the inverse of a matrix using the determinant and the adjoint.

Unit 5: Representations of Linear Transformations

General Outcome
5.0 Find the matrix for a linear transformation relative to any arbitrary basis, and find a basis and a diagonal matrix such that the diagonal matrix is the matrix for a given ;linear transformation relative to the basis when such a diagonal matrix exists.

Specific Learning Outcomes

5.1 Find the matrix for a linear transformation relative to any arbitrary basis.
5.2 Explain how changing the basis will affect the matrix of a linear transformation.
5.3 Find the eigenvalues and corresponding eigenvectors for a given matrix.
5.4 Find a basis consisting of eigenvectors of a linear transformation when such a basis exists.
5.5 Find a basis and a diagonal matrix such that the diagonal matrix is the matrix for a given linear transformation relative to the basis when such a diagonal matrix exists.
5.6 Determine when a matrix is similar to a diagonal matrix.
5.7 Find a diagonal matrix similar to a symmetric matrix.