

## Math 26 – Instructional Objectives and Student Learning Outcomes

**The goal of this course is to provide students with calculation competency, concept understanding, and mathematical literacy in Linear Algebra.**

| <b>Learning Objectives</b><br>Students enrolled in this course will:                   | <b>Student Learning Outcomes</b><br>Students that successfully complete this course will be able to:   |
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| 1. Work with matrices and determine if a given square matrix is invertible.            | <ul style="list-style-type: none"> <li>a. Perform matrix operations.</li> <li>b. Perform row operations and find echelon forms.</li> <li>c. Use row operations to determine if a square matrix is invertible.</li> <li>d. Find the inverse of a square matrix.</li> <li>e. Use the Invertible Matrix Theorem.</li> </ul>   |
| 2. Learn to solve systems of linear equations and application problems requiring them. | <ul style="list-style-type: none"> <li>a. Write a system of linear equations as a matrix equation <math>Ax = b</math>.</li> <li>b. Solve the matrix equation <math>Ax = b</math> using row operations and matrix operations.</li> <li>c. Determine if a system of linear equations has a solution.</li> <li>d. Interpret the meaning of the solution set of a system of linear equations.</li> <li>e. Use systems of linear equations and matrix equations to determine linear dependency or independency.</li> <li>f. Solve application problems that can be modeled by systems of linear equations.</li> </ul> |
| 3. Learn to compute determinants and know their properties.                            | <ul style="list-style-type: none"> <li>a. Compute the determinant of a square matrix by using the definition and by using the properties of determinants.</li> <li>b. Find the determinant of a product of square matrices, of the transpose of a square matrix, and of the inverse of an invertible matrix.</li> </ul>  |
| 4. Learn about and work with vector spaces and subspaces.                              | <ul style="list-style-type: none"> <li>a. Use the definition of vector space to determine if a given set of vectors is a vector space.</li> <li>b. Determine if a subset of a vector space is a subspace.</li> <li>c. Determine if a given set of vectors is a basis for a vector space.</li> <li>d. Determine the dimension of a subspace.</li> <li>e. Find the coordinates of a vector relative to a given basis.</li> </ul>   |

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|  | <ul style="list-style-type: none"> <li>f. Perform a change of basis.</li> <li>g. Find the column space, row space, and null space of a matrix.</li> </ul>  |
| 5. Learn about and work with linear transformations.               | <ul style="list-style-type: none"> <li>a. Determine if a transformation is linear.</li> <li>b. Find matrix representations for a linear transformation.</li> <li>c. Find the range and kernel of a transformation.</li> <li>d. Use linear transformations to prove that vector spaces are isomorphic.</li> </ul> |
| 6. Learn to find and use eigenvalues and eigenvectors of a matrix. | <ul style="list-style-type: none"> <li>a. Find the characteristic equation, eigenvalues and corresponding eigenvectors of a given matrix.</li> <li>b. Determine if a given matrix is diagonalizable.</li> <li>c. Find the eigenvalues and corresponding eigenvectors for a linear transformation.</li> </ul>     |
| 7. Learn about inner products and their uses.                      | <ul style="list-style-type: none"> <li>a. Compute the inner product of two vectors.</li> <li>b. Find the length of a vector and the distance between two vectors.</li> <li>c. Determine if sets of vectors are orthogonal and find orthogonal projections.</li> <li>d. Solve Least-Squares Problems</li> </ul>   |