Math 270 Course Content and Objectives

COURSE CONTENT AND SCOPE - **Lecture:** Outline the topics included in the lecture portion of the course *(Outline reflects course description, all topics covered in class).*	Hours Per Topic	COURSE OBJECTIVES - **Lecture:** Upon successful completion of this course, the student will be able to...*(Use action verbs - see Bloom's Taxonomy for 'action verbs requiring cognitive outcomes.')*
Systems of linear equations and methods of solution.	6	Solve any system of linear equations by any of the following methods: Elementary row operations, Gaussian elimination, Gauss-Jordan reduction, elementary matrices, or triangular factorization. Solve a nonsingular square system of linear equations by either of the following methods: Matrix inversion or Cramer's rule.
Matrices. Diagonal, triangular, and symmetric matrices.	9	Perform matrix operations including matrix addition, and matrix multiplication. Calculate the inverse of a nonsingular matrix. Determine the transpose of a matrix. Compute the Lower Triangular Matrix and Upper Triangular Matrix (LU) decomposition of a matrix with elementary matrices.
Determinants and their properties.	6	Calculate the determinant of a square matrix by the method of cofactors. Compute the adjoint of a square matrix. Calculate the determinant of a square matrix by the method of adjoints. Derive Cramer's rule and apply Cramer's rule to solve a nonsingular square linear system.
Vector spaces. Vector algebra for Rn.	9	Determine whether a set with the operations of vector addition and scalar multiplication is a vector space. Determine whether a subset of a vector space is a subspace. Prove properties of subspaces using appropriate proof-writing techniques. Determine the linear dependence or independence and span of a set of vectors. Prove linear independence of vectors using appropriate proof-writing techniques. Determine whether a set of vectors is a basis of a vector space. Prove properties of subspaces using appropriate proof-writing techniques. Find the dimension of a vector space. Change the representation of a vector from one basis to another (Change of coordinates). Determine the null space, column space, row space, rank, and nullity of a matrix.

Linear transformations. Inverse linear transformations.	6	Determine whether a mapping from one vector space to another is a linear transformation. Prove linearity, injectivity, and surjectivity of functions using appropriate proof-writing techniques. Compute the image and kernel of a linear transformation. Compute the matrix representation of a linear transformation. Compute similar matrix representations for linear operators with respect to different bases. Calculate the dimension of spaces associated with matrices and linear transformations.
Orthogonality. Inner products on a real vector space, angle and orthogonality in inner product spaces, and orthogonal and orthonormal bases.	9	Compute the scalar product of two vectors in Euclidean space. Determine whether two vectors are orthogonal. Determine the fundamental subspaces of a matrix. Compute the orthogonal complement of a subspace. Find the direct sum of two subspaces. Solve the least squares problem using the normal equations. Perform the Gram-Schmidt orthogonalization process on a set of vectors. Use bases and orthonormal bases to solve problems in linear algebra.
Characteristic value problems. Eigenvalues, eigenvectors, and eigenspace. Diagonalization including orthogonal diagonalization of symmetric matrices.	7	Calculate eigenvalues and eigenvectors and use them in applications. Prove properties of eigenvectors and eigenvalues using appropriate proof-writing techniques. Determine the characteristic values and characteristic vectors of a square matrix. Diagonalize a square matrix. Compute the exponential of a square matrix.
Final examination.	2	Final examination.
Total: Total Lecture Hours In Section I Class Hours:	54 54	