NVCC COLLEGE-WIDE COURSE CONTENT SUMMARY
MTH 285 - LINEAR ALGEBRA (3 CR.)

Course Description

Covers matrices, vector spaces, determinants, solutions to systems of linear equations, basis and dimension, eigenvalues, and eigenvectors. Lecture 3 hours per week.

General Course Purpose

This course is primarily for students in mathematics, engineering, the sciences, and computer science. The purpose is to give the student a basic understanding of the concepts of linear algebra.

Entry Level Competencies

Prerequisite is MTH 174 - "Calculus with Analytic Geometry II" or equivalent.

Course Objective

As a result of the learning experiences provided in this course, the student should be able to:

A. solve systems of linear equations using the Gauss-Jordan elimination method,
B. perform the basic operations of matrix algebra,
C. compute determinants,
D. recognize vector spaces and identify properties and characteristics of a matrix as a transformation, with an emphasis on R^n,
E. represent a linear transformation as a matrix and Identify properties of the transformation,
F. compute eigenvalues and eigenvectors,
G. use calculators/computers to assist in the solution of problems, where appropriate.

Major Topics To Be Included

A. Systems of Linear Equations
   1. Row reduction
   2. Echelon and reduced echelon form
   3. Gauss-Jordan elimination

B. Matrix Algebra
   1. Addition, subtraction, multiplication and scaler multiplication of matrices
   2. Transpose and inverse of a matrix
   3. Row and column operations

C. Determinants
   1. Cofactor expansion
   2. Determinant of a product, inverse, transpose, and diagonal matrix

D. Vector spaces with emphasis on R^n
   1. Subspaces
   2. Linear independence
   3. Span and basis
   4. Range, kernel, row space, rank and nullity
   5. Inner product, orthogonality, orthonormality

E. Matrices as Linear Transformations
    1. Kernel and range of a linear transformation
    2. One-to-one, onto, and invertible linear transformations

F. Eigenvalues and Eigenvectors
    1. Multiplicities
    2. Eigenspaces
    3. Diagonalization

Extra Topics (optional)

A. Applications
B. Change of Basis
C. Cramer's Rule
D. Gram-Schmidt orthonormalization
E. Inner Product Spaces
F. Isomorphism
G. Jordan canonical form
H. Least-squares with applications to data fitting
I. LU-Factorization
J. QR-Factorization
K. Singular-value decompositions and pseudo-inverses