

COURSE OUTLINE

MATH-250

Linear Algebra

4 Semester Hours

HOWARD COMMUNITY COLLEGE

Description

In this course, students will develop skills in the basic concepts of linear algebra. These skills will cover areas such as vector spaces, applications to line and plane geometry, linear equations and matrices, similar matrices, linear transformations, eigenvalues, function spaces, determinates quadratic forms and complex vector spaces. The use of the computer algebra system, MATLAB, will be an integral part of the course, Prerequisite: MATH-181 or equivalent. (4 hours weekly).

Statement on General Education and Liberal Learning

A liberal education prepares students to lead ethical, productive, and creative lives and to understand how the pursuit of lifelong learning and critical thinking fosters good citizenship. General education courses form the core of a liberal education within the higher education curriculum and provide a coherent intellectual experience for all students by introducing the fundamental concepts and methods of inquiry in the areas of mathematics, the physical and natural sciences, the social sciences, the arts and the humanities, and composition. This course is part of the general education core experience at Howard Community College.

Overall Course Objectives

Upon successful completion of this course, the student will be able to:

1. Solve systems of linear equations using matrices with elementary row operations.
2. Basic vector arithmetic; calculate vector sums, differences, scalar products and dot products; calculate projections.
3. Use the basic rules of matrix arithmetic and algebra to calculate a product of a scalar and a matrix, matrix sum, a matrix inverse, a matrix transpose, etc.
4. Use the basic concepts of vectors and vector spaces to solve certain matrix equations. $AX=B$
5. Explore matrix factorizations e.g. LU and diagonalizations of square matrices.
6. Identify fundamental vector spaces and subspaces.
7. Find bases and coordinate vectors in general vector spaces.
8. Use concept of a linear transformation by applying it to geometry and to differentiation; develop matrix representations of linear transformations, calculate associated eigenvalues and eigenvectors.
9. Calculate the determinant of a matrix and use it when solving a system of linear equations.
10. Calculate orthogonal and orthogonal and orthonormal bases in inner product spaces.
11. Solve applications dealing with quadratic forms and diagonalizing quadratic forms as applied to conic sections.
12. Use and applications of complex numbers in linear algebra.

Major Topics

- I. Systems of Linear Equations and Matrices
- II. Vectors in Two and Three Dimensional Space
- III. Vector Spaces
- IV. Linear Transformations
- V. Determinants
- VI. Eigenvalues and Eigenvectors
- VII. Applications
 - A. Quadratic Forms and Conic Sections
 - B. Selected uses in physical and social sciences, e.g. Markov Processes
- VIII. Inner Product Spaces
- IX. Complex Numbers in Spaces

Course Requirements

Grading/Exams: Grading procedures will be determined by the individual faculty member within the guidelines of the Mathematics Division and will include several unit exams, projects involving MATLAB and a comprehensive departmental final exam.

Technology requirements: Graphing calculator (TI-84 recommended) and required course software.

Other Course Information

This course may be used as a Mathematics core course or as an Arts and Science elective. Check with your transfer institution concerning transferability for your program.