

CUMBERLAND COUNTY COLLEGE

Course: MA 208 Linear Algebra

Credits: 4

Prerequisites

MA 140. MA 210 is recommended

Description

This is a rigorous math course which stresses the interplay between computational techniques, abstract concepts, and applications. Topics include linear systems, matrices, determinants, vectors, vector spaces, eigenvalues, inner products, diagonalization, and transformations. Some finite and numerical computer science topics are also addressed.

Learning Outcomes

At the completion of this course, students will be able to:

- Represent systems of equations in matrix form and use matrix mathematics to solve the system or determine it is inconsistent
- Prove the various algebraic properties of vectors and matrices
- Describe a subspace, determine if a vector set forms a subset, and determine the fundamental subspaces of a matrix
- Identify and apply linear transformations to a vector set
- Find the orthogonal diagonalization of a matrix and the matrix's spectral decomposition
- Identify a vector space, and recognize a vector space in algebraic applications
- Compute eigenvalues numerically
- Determine the Solutions to Homogeneous Linear Differential Equations

Topical Outline

- Vectors
 - The Geometry and Algebra of Vectors
 - Length, Angle, and Dot Product
 - Lines, Planes, and Projections
 - Applications in Physics
- Systems of Linear Equations
 - Direct Methods, Existence and Uniqueness of Solutions
 - Spanning Sets and Linear Independence
 - Various Applications
- Matrices
 - Matrix Operations
 - Matrix Algebra
 - The Inverse of a Matrix
 - The LU Factorization
 - Subspaces, Basis, Dimension, and Rank
 - Simple Linear Transformations

- Applications
- Eigenvalues and Eigenvectors
 - Determinants
 - Eigenvalues and Eigenvectors of a square matrix
 - Similarity and Diagonalization
 - Iterative Methods for computing Eigenvalues
 - Applications
- Orthogonality
 - Orthogonality in \mathbb{R}^3 and \mathbb{R}^n
 - Orthogonal Complements and Projections
 - The Gram-Schmidt Process and QR Factorization
 - Orthogonal Diagonalization of Symmetric Matrices
 - Spectral Decomposition and Applications
- Vector Spaces
 - Vector Spaces and Subspaces
 - Linear Independence, Basis, and Dimension
 - Change of Basis
 - Linear Transformations
 - The Kernel and Range of a Linear Transformation
 - The Matrix of a Linear Transformation
 - Applications
- Inner Product Spaces
 - Norms and Distance Functions
 - Least Squares Approximation
 - The Singular Value Decomposition

Required Texts and Other Materials

Linear Algebra: A Modern Introduction, by David Poole 4th ed: Brooks/Cole 2011.

Student Assessment

Assessment may be accomplished through projects, portfolios, online assignments, exams, presentations and/or papers.

Academic Integrity

Plagiarism is cheating. Plagiarism is presenting in written work, in public speaking, and in oral reports the ideas or exact words of someone else without proper documentation. Whether the act of plagiarism is deliberate or accidental [ignorance of the proper rules for handling material is no excuse], plagiarism is, indeed, a “criminal” offense. As such, a plagiarized paper or report automatically receives a grade of **ZERO** and the student may receive a grade of **F** for the semester at the discretion of the instructor.

Available Resources

If you are having difficulty with work in this class, tutoring is available through the Success Center. If you think that you might have a learning disability, contact Project Assist at 856.691.8600, x1282 for information on assistance that can be provided to eligible students.

(List availability of open labs and/or writing center)

Before Withdrawing From This Course

If a student experiences adverse circumstances while enrolled in this course and considers withdrawing, s/he should see an advisor (division or advisement center) BEFORE withdrawing from the class. A withdrawal may cause harmful repercussions to completion rate standards and overall GPA which can limit or eliminate future financial aid in addition to causing academic suspension.