RARITAN VALLEY COMMUNITY COLLEGE
ACADEMIC COURSE OUTLINE

MATH 256: LINEAR ALGEBRA

I. Basic Course Information

    A. Course Number and Title: MATH 256 Linear Algebra

    B. New or Modified Course: Modified Course

    C. Date of Proposal: Semester: Fall   Year: 2024

    D. Effective Term: Fall 2025

    E. Sponsoring Department: Math and Computer Science

    F. Semester Credit Hours: 4

    G. Weekly Contact Hours: 4   Lecture: 4
                                     Laboratory: 0
                                       Out of class student work per week: 8

    H. ☒ Prerequisite(s): MATH 152 Calculus II with grade of C or higher or MATH
                     152H Honors with grade of C or higher.
        ☐ Corequisite(s):

    I. Laboratory Fees: None

II. Catalog Description:

Prerequisite: MATH 152 Calculus II with a grade of C or higher or MATH 152H Calculus II Honors with a grade of C or higher. Includes systems of linear equations, real and complex matrix algebra, determinants, vector spaces, inner product spaces, linear transformations, eigenvalues and eigenvectors and their applications to engineering, management and social science.

III. Statement of Course Need
    A. This course serves as an elective in the Mathematics AS Degree.
    B. This course does not have a lab component.
    C. This course generally transfers as a Mathematics program requirement or
       program elective or as a mathematics general elective dependent on the transfer
       institution.

IV. Place of Course in College Curriculum

    A. This course is a free elective.

    B. This course serves as a General Education requirement in Mathematics.

    C. This course serves as an elective in the Physics, Mathematics, Information Systems, and Computer Science AS degrees.

    D. To see course transferability: a) for New Jersey schools, go to the NJ Transfer website, www.njtransfer.org; b) for all other colleges and universities, go to the individual websites.

V. Outline of Course Content

A. Linear Equations
    1. Linear Systems
    2. Gaussian and Gauss-Jordan elimination
    3. Applications
B. Matrices
    1. Operations
    2. Properties
    3. Inverse
    4. Elementary matrices
    5. Applications
C. Determinants
    1. Definition
    2. Evaluation
    3. Properties
    4. Eigenvalues
    5. Applications
D. Vector Spaces
    1. Vectors in R^n
    2. Spaces
    3. Subspaces
    4. Linear Independence
    5. Basis
    6. Rank
    7. Change of Basis
    8. Applications
E. Inner Product Spaces
    1. Inner Product
    2. Gram-Schmidt Process
    3. Models, Least Squares Analysis
    4. Applications
F. Linear Transformations
    1. Introduction
    2. Kernel and Range
    3. Matrices for Linear Transformations

4. Transition Matrices and Similarity
5. Applications
G. Eigenvalues and Eigenvectors
 1. Eigenvalues and Eigenvectors
 2. Diagonalization
 3. Symmetric matrices
 4. Applications
H. Complex Vector Spaces
 1. Complex numbers in rectangular and polar forms
 2. Complex vector spaces and inner product spaces
 3. Unitary and Hermitian matrices
 4. Applications

VI.   A. <u>Course Learning Outcomes</u>

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

1. Solve application problems that are modeled by linear systems of equations with 3 or more variables using Gauss-Jordan elimination methods and other matrix methods. (GE-2)
2. Recognize the structure of vector spaces and inner product spaces. (GE-2)
3. Construct orthogonal bases for vector spaces using the Gram-Schmidt process.(GE-2)
4. Solve application problems using eigenvalues and eigenvectors.(GE-2)
5. Apply matrix operations to matrices of complex numbers.(GE-2)
6. Construct proofs of propositions involving one or more of the following: matrices, determinants, vector spaces and inner product spaces.(GE-2)

 B. <u>Assessment Instruments</u>
 1. Tests
 2. Final examination (required for course assessment).
 3. Projects / Labs
 4. Quizzes

VII. Grade Determinants

 A. Cumulative final examination (required)
 B. Tests   (required)
 C. Projects / Labs
 D. Individual teacher determinants

Primary formats, modes, and methods for teaching and learning that may be used in the course:

A. lecture/discussion
B. small-group work
C. computer-assisted instruction
D. student collaboration

VIII. Texts and Materials

Suggested Textbook: *Elementary Linear Algebra,* latest ed., by Larson, Edwards, and Falvo, Houghton Mifflin

(Please Note: The course outline is intended only as a guide to course content and resources. Do not purchase textbooks based on this outline. The RVCC Bookstore is the sole resource for the most up-to-date information about textbooks.)

IX. Resources

No unusual resources needed.

X. Check One: ☐Honors Course ☐Honors Options ☒ N/A