NEW RIVER Community College

DUBLIN, VIRGINIA
COURSE PLAN

Course Number and Title: MTH 266 Linear Algebra

Prepared by: NRCC Math Faculty   Fall 2025
                                                                        (Date)

Approved by: *S. Tolbert-Hургр*   Fall 2025
                              (Dean)   (Date)

Course Description

Covers matrices, vector spaces, determinants, solutions of systems of linear equations, basis and dimension, eigenvalues, and eigenvectors. Features instruction for mathematical, physical and engineering science programs.
Lecture 3 hours. Total 3 hours per week.
Prerequisite: Completion of MTH 263 or equivalent with a grade of B or better or MTH 264 or equivalent with a grade of C or better.
3 credits

Introduction

The course satisfies a mathematics requirement for mathematical, computer, physical, and engineering science programs. The course is designed to develop skills and understanding of the basic operations and concepts of linear algebra.

Student Learning Outcomes

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

A. Matrices and Systems of Equations
   a. Use correct matrix terminology to describes various types and features of matrices (triangular, symmetric, row echelon form, et.al.)
   b. Use Gauss-Jordan elimination to transform a matrix into reduced row echelon form
   c. Determine conditions such that a given system of equations will have no solution, exactly one solution, or infinitely many solutions
   d. Write the solution set for a system of linear equations by interpreting the reduced row echelon form of the augmented matrix, including expressing infinitely many solutions in terms of free parameters
   e. Write and solve a system of equations modeling real world situations such as electric circuits or traffic flow
B. Matrix Operations and Matrix Inverses

     a. Perform the operations of matrix-matrix addition, scalar-matrix multiplication, and matrix-matrix multiplication on real and complex valued matrices

     b. State and prove the algebraic properties of matrix operations
     c. Find the transpose of a real valued matrix and the conjugate transpose of a complex valued matrix
     d. Identify if a matrix is symmetric (real valued)
     e. Find the inverse of a matrix, if it exists, and know conditions for invertibility.
     f. Use inverses to solve a linear system of equations

C. Determinants
     a. Compute the determinant of a square matrix using cofactor expansion
     b. State, prove, and apply determinant properties, including determinant of a product, inverse, transpose, and diagonal matrix
     c. Use the determinant to determine whether a matrix is singular or nonsingular
     d. Use the determinant of a coefficient matrix to determine whether a system of equations has a unique solution

D. Norm, Inner Product, and Vector Spaces
     a. Perform operations (addition, scalar multiplication, dot product) on vectors in Rn and interpret in terms of the underlying geometry
     b. Determine whether a given set with defined operations is a vector space

E. Basis, Dimension, and Subspaces
     a. Determine whether a vector is a linear combination of a given set; express a vector as a linear combination of a given set of vectors
     b. Determine whether a set of vectors is linearly dependent or independent
     c. Determine bases for and dimension of vector spaces/subspaces and give the dimension of the space
     d. Prove or disprove that a given subset is a subspace of Rn
     e. Reduce a spanning set of vectors to a basis
     f. Extend a linearly independent set of vectors to a basis
     g. Find a basis for the column space or row space and the rank of a matrix
     h. Make determinations concerning independence, spanning, basis, dimension, orthogonality and orthonormality with regards to vector spaces

F. Linear Transformations
     a. Use matrix transformations to perform rotations, reflections, and dilations in Rn
     b. Verify whether a transformation is linear
     c. Perform operations on linear transformations including sum, difference and composition
     d. Identify whether a linear transformation is one-to-one and/or onto and whether it has an inverse
     e. Find the matrix corresponding to a given linear transformation T: Rn -> Rm
     f. Find the kernel and range of a linear transformation
     g. State and apply the rank-nullity theorem
     h. Compute the change of basis matrix needed to express a given vector as the coordinate vector with respect to a given basis

G. Eigenvalues and Eigenvectors
     a. Calculate the eigenvalues of a square matrix, including complex eigenvalues.

b. Calculate the eigenvectors that correspond to a given eigenvalue, including complex eigenvalues and eigenvectors.
c. Compute singular values
d. Determine if a matrix is diagonalizable
e. Diagonalize a matrix
f.

General Education Student Learning Outcomes Included in Course

General education at NRCC provides the educational foundation necessary to promote intellectual and personal development. Upon completing the associate degree, graduates will demonstrate competency in student learning outcomes in 1) civic engagement, 2) critical thinking, 3) professional readiness, 4) quantitative literacy, 5) scientific literacy, and 6) written communication.

This course includes the following general education student learning outcomes:

- Explain numerical information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words).
- Convert relevant information into various mathematical forms (e.g., equations, graphs, diagrams, tables, words).
- Accurately solve mathematical problems.
- Make judgements and draw relevant conclusions from quantitative analysis of data and predict future trends when appropriate.

Instructional Methods
The instructional procedures may include lectures, discussions, in-class work, homework, and tests. Further information is available in the Course Syllabus.

Instructional Materials

Textbook: MyLab Math with Pearson eText Instant Access for Linear Algebra & Its Applications. 6th. Lay, McDonald, Lay. Pearson.

Calculator: See instructor.

Other: Pencils and paper

Course Content

- Matrices: including operations, Gauss-Jordan elimination, reduced row-echelon form, inverses, solutions to linear systems and determinants
- Vectors and Vector Spaces
- Basis and dimension
- Eigenvalues and Eigenvectors, including complex
- Linear Transformations

Grading/Evaluation

Students are evaluated on the following and other work as considered appropriate by the instructor:

- *class attendance, participation, and discussion*
- *assignments*
- *quizzes*
- *tests*
- *final exam*

See the course syllabus for details on how grades for this course will be calculated using percentages or points.

Grading scale:

90 - 100	= A
80 - 89	= B
70 - 79	= C
60 - 69	= D
Below 60	= F

Attendance

Regular attendance at classes is required. When absence from a class becomes necessary, it is the responsibility of the student to inform the instructor prior to the absence whenever possible. The student is responsible for the completion of all study missed during an absence. Any instruction missed and not completed will affect the grade of the student regardless of the reason for the absence.

Cheating/Plagiarism Policy

Students are expected to complete their own work and maintain complete academic honesty. Honesty develops into integrity. All aspects of the course are covered by the Academic Honesty section in the New River Community College Student Handbook.

Any student found cheating or plagiarizing will receive a zero for that work and it could result in an "F" for the course. This includes plagiarism, which is defined as "To present another's words or ideas as one's own or without attribution" (American Heritage Dictionary, 2019). Remember that plagiarism includes using words or ideas from Internet sites, as well as copying from print

sources.

AI Usage

Different instructors will have different expectations around students' usage of artificial intelligence (AI) tools depending upon the goals and learning outcomes of a course. Students should refer to the class syllabus/addendum for more specific guidelines. It is important to understand that using unauthorized AI tools to complete course work may result in an academic honesty violation. Students should always ask their instructor for guidance if they have any questions about the appropriateness of using a tool.

Withdrawal Policy

Student Initiated Withdrawal Policy

A student may drop or withdraw from a class without academic penalty during the first 60 percent of a session. For purposes of enrollment reporting, the following procedures apply:

If a student withdraws from a class prior to the termination of the add/drop period for the session, the student will be removed from the class roll and no grade will be awarded.

After the add/drop period, but prior to completion of 60 percent of a session, a student who withdraws from a class will be assigned a grade of "W." A grade of "W" implies that the student was making satisfactory progress in the class at the time of withdrawal, that the withdrawal was officially made before the deadline published in the college calendar, or that the student was administratively transferred to a different program.
After that time, if a student withdraws from a class, a grade of "F" or "U" will be assigned. Exceptions to this policy may be made under documented mitigating circumstances if the student was passing the course at the last date of attendance.

A retroactive grade of "W" may be awarded only if the student would have been eligible under the previously stated policy to receive a "W" on the last date of class attendance. The last date of attendance for a distance education course will be the last date that work was submitted.

Students requesting a late withdrawal due to documented mitigating circumstances should contact the Coordinator of Admissions and Records.

No-Show Policy

A student must either attend face-to-face courses or demonstrate participation in online courses by the last date to drop for a refund. A student who does not meet this deadline will be reported to the Admissions and Records Office and will be

withdrawn as a no-show student. No refund will be applicable, and the student will not be allowed to attend/participate in the class or submit assignments. Failure to attend or participate in a course will adversely impact a student's financial aid award.

Instructor Initiated Withdrawal

A student who adds a class or registers after the first day of class is counted absent from all class meetings missed. Each instructor is responsible for keeping a record of student attendance (face-to-face classes) or performance/participation (online classes) in each class throughout the semester.

When a student's absences equal twice the number of weekly meetings of a class (equivalent amount of time for summer session), the student may be dropped for unsatisfactory attendance in the class by the instructor.

Since attendance is not a valid measurement for online courses, a student may be withdrawn due to non-performance. A student should refer to his/her online course plan for the instructor's policy.

In accordance with the No-Show Policy, a student who has not attended class or requested/accessed online learning materials by the last day to drop the class and receive a refund must be withdrawn by the instructor during the following week. No refund will be applicable.

When an instructor withdraws a student for unsatisfactory attendance (face-to-face class) or non-performance (online class), the last date of attendance/participation will be documented. Withdrawal must be completed within five days of a student's meeting the withdrawal criteria. A grade of "W" will be recorded during the first sixty percent (60%) period of a course. A student withdrawn after the sixty percent (60%) period will receive a grade of "F" or "U" except under documented mitigating circumstances when a letter of appeal has been submitted by the student. A copy of this documentation must be placed in the student's academic file.

The student will be notified of the withdrawal by the Admissions and Records Office. An appeal of reinstatement into the class may be approved only by the instructor.

Non-Discrimination Statement

This College promotes and maintains educational opportunities without regard to race, color, national origin, religion, disability, sex, sexual orientation, gender identity, ethnicity, marital status, pregnancy, childbirth or related medical conditions including lactation, age (except when age is a bona fide occupational qualification), veteran status, or other non-merit factors.

Disability Statement

If you are a student with a disability and in need of accommodations for this course, please contact the Center for Disability Services (CDS) for assistance. CDS is located within the Advising Center in Rooker Hall. For more information about disabilities services, see Center for Disability Services Policies and Procedures.

Academic Success Center (Tutoring Center)

Free tutoring is available to all NRCC students in any subject area. In-person, one-on- one, and group tutoring sessions are available both in Dublin (Godbey 131) and at the mall site (room 202). Online tutoring sessions are also available to accommodate students who are unable to attend an in-person tutoring session. In addition, the Academic Success Center offers several online tutorials which are posted in Canvas on the NRCC Tutoring Services tab. For more information about the Academic Success Center at NRCC, please visit https://www.nr.edu/asc/ or call 1-540-674-3664.

General Health Guidelines and Student Expectations

In guarding against the transmission of infectious illnesses, it is imperative that we follow specific health-related best practices.

As a condition for attending class or otherwise using NRCC facilities, I, as a student, agree to the following conditions:

I will follow all CDC, state, and local guidelines pertaining to diseases and health conditions. More information can be found at the links below.

    a CDC Diseases and Conditions: https://www.cdc.gov/nchs/fastats/diseases-and-conditions.htm

    b Virginia Department of Health: https://www.vdh.virginia.gov/

    c New River Health District: https://www.nrvroadtowellness.com/

In the event of health threats or changes in guidelines, I understand in-person classes may be moved online, fully or partially, and I will need to be prepared to access technology and the internet with as little as 24 hours' notice.

By continuing my enrollment in class(es), **I agree to meet each of the expectations outlined above.**

New River Community College encourages all students to fully vaccinate against transmissible illnesses. Information about vaccinations can be found on the Virginia Department of Health website at www.vdh.virginia.gov.

Required Safety Training

Virginia law, effective August 1, 2024, requires campus safety and emergency preparedness training for all students enrolled in on-campus classes at public colleges and universities. The training must focus on an active shooter event and

be completed by the last day of their first term in college.

To comply with this legislation, students will view a college-provided awareness and training video during the first two weeks of class for this course.

Evacuation Procedure

Please note the evacuation route posted at the classroom doorway. **Two routes are marked in case one route might be blocked.**