GAVILAN COLLEGE
5055 Santa Teresa Blvd
Gilroy, CA 95023

Course Outline

COURSE: MATH 2 DIVISION: 20 ALSO LISTED AS:

TERM EFFECTIVE: Summer 2025 CURRICULUM APPROVAL DATE: 06/10/2025

SHORT TITLE: LINEAR ALGEBRA

LONG TITLE: Linear Algebra

Units	Number of Weeks	Type	Contact Hours/Week	Total Contact Hours
3	18	Lecture:	3	54
		Lab:	0	0
		Other:	0	0
		Total:	3	54

Out of Class Hrs:	108.00
Total Learning Hrs:	162.00

COURSE DESCRIPTION:

A standard one semester Linear Algebra course covering systems of linear equations, vectors and matrices, determinants, vector spaces, linear transformations, eigenvalues, and eigenvectors. (C-ID: MATH 250) PREREQUISITE: Mathematics 1B with a grade of 'C' or better.

PREREQUISITES:

Completion of MATH 1B, as UG, with a grade of C or better.

CREDIT STATUS: D - Credit - Degree Applicable

GRADING MODES

L - Standard Letter Grade

REPEATABILITY: N - Course may not be repeated

SCHEDULE TYPES:

02 - Lecture and/or discussion
05 - Hybrid
71 - Dist. Ed Internet Simultaneous
72 - Dist. Ed Internet Delayed

STUDENT LEARNING OUTCOMES:

By the end of this course, a student should:

1. Solve systems of linear equations using various techniques; understand and apply matrix operations and their properties.

2. Compute determinants using various techniques and understand their properties and applications (including eigenvalues).

3. Demonstrate proficiency in vector spaces, inner product spaces, and linear transformations.

4. Formulate and understand simple proofs; learn basic programming commands related to linear algebra.

COURSE OBJECTIVES:

By the end of this course, a student should:

1. Solve systems of linear equations using various techniques including Gaussian elimination and Gauss-Jordan elimination.

2. Define homogeneous linear systems and understand their properties.

3. Perform matrix operations including addition, subtraction, and multiplication. Understand the properties and conditions associated with each operation.

4. Compute the matrix inverse, where applicable, and use it to solve a system of linear equations. Know the conditions under which a matrix is invertible. Understand

properties of matrix inverses including the inverse of a matrix product. Construct a matrix transpose and know its properties.

5. Define elementary matrices, represent an invertible matrix as a product of elementary matrices. Compute the LU-factorization of a matrix and use it to solve a

system of linear equations.

6. Compute the determinant of a square matrix using cofactor expansion. Use the properties of determinants to simplify determinant calculation.

7. Prove basic theorems related to determinants. Understand applications of determinants.

8. Apply Cramer's rule to solve linear systems.

9. Define vector spaces. Determine whether a set is a vector space. Provide examples of important vector spaces.

10. Define a subspace and test for a subspace. Understand theorems related to subspaces.

11. Define span and spanning sets. Differentiate between linearly dependent and linearly independent sets of vectors. Find a basis and the dimension of a vector

space.

12. Determine the row space, column space, and nullspace of a matrix.

13. Know the definition and properties of inner products/ inner product spaces. Use the inner product to determine various properties of vectors including norm,

angle, orthogonality, and distance. Find orthogonal projections.

14. Construct an orthogonal and orthonormal basis using the Gram-Schmidt Process.

15. Define linear transformations, transformations from R to R, matrix transformations, one-to-one, kernel, range, rank, nullity and isomorphism.

16. Define eigenvalues and eigenvectors. Determine eigenvalues, eigenvectors, and eigenspaces for a square matrix. Define similar matrices and the condition for

diagonalization.

17.Describe the equivalent conditions for a square matrix.

COURSE CONTENT:

Curriculum Approval Date: 06/10/2025

16 Hours

Systems of linear equations: basic terminology and notation. Homogeneous Linear Systems; trivial and nontrivial solutions. Introduction to Matrices. Addition and multiplication of matrices. Determinants, including Cramer's Rule. Gaussian elimination algorithm. Inverse of matrix: definition, invertibility, method of computing, properties. Special matrices: diagonal, triangular, and symmetric. Properties of the determinant function. LU -decomposition of a Matrix.

14 Hours

Vector algebra for Rn. Linear combination of Vectors. Vector subspaces. Linear dependence, linear independence. Basis and Dimension. Elementary Operations. Row Space and Column Space. Null Space, rank and nullity. General Vector Spaces. The dot product, norm of a vector. Inner Products. IP Spaces. Gram - Schmidt Orthogonalization Process.

7 Hours

Eigenvalues and Eigenvectors. Characteristic Polynomial. Calculating Eigenvlaues and Eigenvectors and the Cayley- Hamilton Theorem. Properties of Eigenvalues.

8 Hours

Diagonalization of matrices and symmetric matrices. Orthogonal Matrix. IP spaces. Angle in IP spaces. Linear transformations. Image and kernel.

Isomorphism. Inverse Linear Transformation.

6 Hours

Linear mappings and Matrices. Similarity theorems. Introduction to numerical methods of Linear Algebra.

1 Hour

Review for final exam

2 Hours

Final Exam

Comprehensive over the entire course with evaluation of each of the areas previously encountered.

METHODS OF INSTRUCTION:

Instruction will follow a standard lecture/discussion format. Extensive homework will be assigned in order to assure mastery of the concepts covered in class. Students will also be required to utilize technology to enhance their understanding of the material. Students will be given opportunities to work together on problems given in class and group projects.

OUT OF CLASS ASSIGNMENTS:

Required Outside Hours 108

Assignment Description

1. Analyze and study pertinent text material, solved examples and lecture notes.
2. Apply principles and skills covered in class by solving regularly-assigned homework problems.
3. Regularly synthesize course materials in preparation for exams.
4. Projects to apply concepts learned in class

METHODS OF EVALUATION:

Problem-solving assignments

Evaluation Percent 10

Evaluation Description

Homework problems, quizzes.

Writing assignments

Evaluation Percent 10

Evaluation Description

Out of class projects.

Objective examinations

Evaluation Percent 80

Evaluation Description

In-class written exams.

REPRESENTATIVE TEXTBOOKS:

Linear Algebra: A Modern Introduction, 5th Edition, David Poole, Cengage Learning, 2026 or a comparable textbook/material.

ISBN: ISBN: 979-8-214-01305-3

12 Grade Verified by: Microsoft Word

ARTICULATION and CERTIFICATE INFORMATION

Associate Degree:

GAV B4

GAV Area 2 = Math Con & Q Reas

CSU GE:

CSU B4

IGETC:

IGETC 2A

CSU TRANSFER:

Transferable CSU

UC TRANSFER:

Transferable UC

SUPPLEMENTAL DATA:

Basic Skills: N
Classification: Y
Noncredit Category: Y
Cooperative Education:
Program Status: 1 Program Applicable
Special Class Status: N
CAN: MATH26
CAN Sequence: XXXXXXXX
C-ID: (MATH 250)
Prior to College Level: Y
Non Credit Enhanced Funding: N
Funding Agency Code: Y
In-Service: N
Occupational Course: E
Course Control Number: CCC000293714
Sports/Physical Education Course: N
Taxonomy of Program: 170100