**MATH 5 Course Outline as of Spring 2010**

# CATALOG INFORMATION

Dept and Nbr: MATH 5 Title: INTRO TO LINEAR ALGEBRA
Full Title: Introduction to Linear Algebra
Last Reviewed: 2/8/2021

| Units | | Course Hours per Week | | Nbr of Weeks | Course Hours Total | |
|---|---|---|---|---|---|---|
| Maximum | 3.00 | Lecture Scheduled | 3.00 | 17.5 | Lecture Scheduled | 52.50 |
| Minimum | 3.00 | Lab Scheduled | 0 | 17.5 | Lab Scheduled | 0 |
| | | Contact DHR | 0 | | Contact DHR | 0 |
| | | Contact Total | 3.00 | | Contact Total | 52.50 |
| | | Non-contact DHR | 0 | | Non-contact DHR | 0 |

Total Out of Class Hours: 105.00 Total Student Learning Hours: 157.50

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|---|---|
| Title 5 Category: | AA Degree Applicable |
| Grading: | Grade Only |
| Repeatability: | 00 - Two Repeats if Grade was D, F, NC, or NP |
| Also Listed As: | |
| Formerly: | |

**Catalog Description:**
An introduction to linear algebra including the theory of matrices, determinants, vector spaces, linear transformations, eigenvectors, eigenvalues and applications.

**Prerequisites/Corequisites:**
Completion of MATH 1B or higher (VF)

**Recommended Preparation:**
Concurrent enrollment in MATH 1C or MATH 2

**Limits on Enrollment:**

**Schedule of Classes Information:**
Description: An introduction to linear algebra including the theory of matrices, determinants, vector spaces, linear transformations, eigenvectors, eigenvalues and applications. (Grade Only)
Prerequisites/Corequisites: Completion of MATH 1B or higher (VF)
Recommended: Concurrent enrollment in MATH 1C or MATH 2
Limits on Enrollment:
Transfer Credit: CSU;UC.
Repeatability: Two Repeats if Grade was D, F, NC, or NP

## ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

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|---|---|---|---|
| **AS Degree:** | **Area** | Effective: | Inactive: |
| **CSU GE:** | **Transfer Area** | Effective: | Inactive: |
| **IGETC:** | **Transfer Area** | Effective: | Inactive: |

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|---|---|---|---|---|---|
| **CSU Transfer:** | Transferable | Effective: | Spring 1989 | Inactive: | |
| **UC Transfer:** | Transferable | Effective: | Spring 1989 | Inactive: | |

**CID:**
CID Descriptor:MATH 250 Introduction to Linear Algebra
SRJC Equivalent Course(s): MATH5

**Certificate/Major Applicable:**
Major Applicable Course

## COURSE CONTENT

**Outcomes and Objectives:**
Upon successful completion of the course, students will be able to:
1. Solve systems of linear equations using Gauss-Jordan elimination and Cramer's rule.
2. Define operations on matrices, invertibility, elementary matrices, orthogonal matrices.
3. Apply properties of determinants to matrices.
4. Evaluate determinants using row reduction techniques.
5. Define cofactors and adjoints of determinants to determine the inverse of a matrix.
6. Define properties of vectors, subspace, span, linear independence, bases, inner product spaces, and orthonormal bases.
7. Define and determine dimension rank of solution space of a system of linear equations.
8. Define kernel, range, rank, nullity, matrix representation of linear transformation, similarity, and change of basis.

**Topics and Scope:**

I. Matrices
   A. Systems of linear equations
   B. Gauss-Jordan elimination
   C. Operations on matrices
   D. Invertibility
   E. Elementary matrices
   F. Orthogonal matrices
II. Determinants
   A. Properties
   B. Evaluation by row reduction
   C. Cofactors and adjoints
   D. Formula for inverse of a matrix
   E. Cramer's rule
III. Vector Spaces
   A. Defining properties

B. Subspace
C. Span
D. Linear independence
E. Basis
F. Dimension
G. Rank
H. Solution space of a system of linear equations
I. Inner product spaces
J. Orthonormal bases
K. Gram-Schmidt process

IV. Linear Transformations
A. Kernel
B. Range
C. Rank and nullity
D. Matrix representation of linear transformation
E. Similarity
F. Change of basis

V. Eigenvectors and Eigenvalues
A. Characteristic equations
B. Eigenspaces
1. Diagonalization of matrices
2. Orthogonal diagonalization of symmetric matrices

VI. Applications may include:
A. Differential equations
B. Fourier series
C. Quadratic forms
D. Gauss-Seidel method
E. Partial pivoting
F. Eigenvalue approximation
G. Others

**Assignment:**

1. Reading outside of class (0-50 pages per week)
2. Problem set assignments (15-30)
3. Midterm exams (2-5), quizzes (0-20) and final exam

**Methods of Evaluation/Basis of Grade:**

**Writing:** Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

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| None, This is a degree applicable course but assessment tools based on writing are not included because problem solving assessments are more appropriate for this course. | Writing<br>0 - 0% |

**Problem Solving:** Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

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| Homework assignments | Problem solving<br>5 - 20% |

**Skill Demonstrations:** All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

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| None | Skill Demonstrations<br>0 - 0% |

**Exams:** All forms of formal testing, other than skill performance exams.

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| Multiple choice, Free response exams, quizzes | Exams<br>80 - 95% |

**Other:** Includes any assessment tools that do not logically fit into the above categories.

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| None | Other Category<br>0 - 0% |

**Representative Textbooks and Materials:**
Elementary Linear Algerbra (9th). Anton, Howard. Wiley: 2005 (classic)
Linear Algebra and Its Applications (3rd). Lay,  David C. Addison Wesley: 2003 (classic)