

**Course Information**

<b>Course Title</b>	Linear Algebra
<b>Course Prefix, Num. and Title</b>	MATH 2318
<b>Division</b>	Math and Physical Science
<b>Department</b>	Mathematics
<b>Course Type</b>	Academic General Education Course (from ACGM, but not WCJC Core)
<b>Course Catalog Description</b>	Introduces and provides models for application of the concepts of vector algebra. Topics include finite dimensional vector spaces and their geometric significance; representing and solving systems of linear equations using multiple methods, including Gaussian elimination and matrix inversion; matrices; determinants; linear transformations; quadratic forms; eigenvalues and eigenvector; and applications in science and engineering.
<b>Pre-Requisites</b>	MATH 2414 Calculus II
<b>Co-Requisites</b>	None

**Semester Credit Hours**

<b>Total Semester Credit Hours (SCH): Lecture Hours:</b>	3:3:0
<b>Lab/Other Hours</b>	
<b>Equated Pay Hours</b>	3
<b>Lab/Other Hours Breakdown: Lab Hours</b>	0
<b>Lab/Other Hours Breakdown: Clinical Hours</b>	0
<b>Lab/Other Hours Breakdown: Practicum Hours</b>	0
<b>Other Hours Breakdown</b>	0

**Approval Signatures**

<b>Title</b>	<b>Signature</b>	<b>Date</b>
<b>Prepared by:</b>		
<b>Department Head:</b>		
<b>Division Chair:</b>		
<b>Dean/VPI:</b>		
<b>Approved by CIR:</b>		

## Additional Course Information

**Topical Outline:** Each offering of this course must include the following topics (be sure to include information regarding lab, practicum, and clinical or other non-lecture instruction).

### Chapter 1: Linear Equations in Linear Algebra

- 1.1: Systems of Linear Equations
- 1.2: Row Reduction and Echelon Forms
- 1.3: Vector Equations
- 1.4: The Matrix Equation  $Ax=b$
- 1.5: Solution Sets of Linear Systems
- 1.6: Applications of Linear Systems (Optional?)
- 1.7: Linear Independence
- 1.8: Introduction to Linear Transformations
- 1.9: The Matrix of Linear Transformations
- 1.10: Linear Models in Business, Science, and Engineering

### Chapter 2: Matrix Algebra

- 2.1: Matrix Operations
- 2.2: The Inverse Matrix
- 2.3: Characterizations of Invertible Matrices

### Chapter 3: Determinants

- 3.1: Introduction to Determinants
- 3.2: Properties of Determinants
- 3.3: Cramer's Rule, Volume, and Linear Transformations

### Chapter 4: Vector Spaces

- 4.1: Vector Spaces and Subspaces
- 4.2: Null Spaces, Column Spaces, and Linear Transformations
- 4.3: Linearly Independent Sets; Bases
- 4.4: Coordinate Systems
- 4.5: The Dimension of a Vector Space
- 4.6: Change of Basis

### Chapter 5: Eigenvalues and Eigenvectors

- 5.1: Eigenvectors and Eigenvalues
- 5.2: The Characteristic Equation
- 5.3: Diagonalization
- 5.4: Eigenvalues and Linear Transformations
- 5.5: Complex Eigenvalues
- 5.7: Applications to Differential Equations

### Chapter 6: Orthogonality and Least Squares

- 6.1: Inner Product, Length, and Orthogonality
- 6.2: Orthogonal Sets
- 6.3: Orthogonal Projections

## Course Learning Outcomes:

### Learning Outcomes – Upon successful completion of this course, students will:

1. Be able to solve systems of linear equations using multiple methods, including Gaussian elimination and matrix inversion.
2. Be able to carry out matrix operations, including inverses and determinants.
3. Demonstrate understanding of the concepts of vector space and subspace.
4. Demonstrate understanding of linear independence, span, and basis.
5. Be able to determine eigenvalues and eigenvectors and solve problems involving eigenvalues.
6. Apply principles of matrix algebra to linear transformations.
7. Demonstrate application of inner products and associated norms.

### Methods of Assessment:

Final Exam (Required)

Other Methods of Assessment:

- Hour Exams
- Homework
- Quizzes
- Short Answer
- Discussion Board
- Participation
- Projects

### Required text(s), optional text(s) and/or materials to be supplied by the student:

“Linear Algebra and its Applications” by Lay, McDonald, and Lay, Pearson, 6<sup>th</sup> edition

### Suggested Course Maximum:

35

### List any specific or physical requirements beyond a typical classroom required to teach the course.

Students must have computer access to the WCJC website, their WCJC student email and online accounts. WCJC has open computer labws, with internet access, on all campuses for students to use.

### Course Requirements/Grading System:

Final Exam 15-30%

Other Course Requirements 70-85%

A = 90-100

B = 80-89

C = 70-79

D = 60-69

F = 59 or below

## Curriculum Checklist:

**Administrative General Education Course** (from ACGM, but not in WCJC Core) – No additional documents needed.

**Administrative WCJC Core Course.** Attach the Core Curriculum Review Forms

Critical Thinking

Communication

Empirical & Quantitative Skills

Teamwork

Social Responsibility

Personal Responsibility

**WECM Course** -If needed, revise the Program SCANS Matrix and Competencies Checklist