



# Alabama Community College System

## MTH 237 Linear Algebra

### I. MTH 237 Linear Algebra– 3 Semester Hours

### II. Course Description

This course introduces the basic theory and application of the following topics: systems of linear equations and matrices, (finite-dimensional) vector spaces, linear transformations and matrices, determinants, eigenvalues and eigenvectors, inner product and orthogonality, Gram-Schmidt, least squares, and the diagonalization of symmetric matrices.

### III. Prerequisite

Grade of C or higher in MTH 126

### IV. Textbook

Due to the varied selection of quality college-level textbooks, each college will select the textbook needed to meet the requirements of this course.

### V. Course Objectives

By the end of the course, students will be able to:

1. perform matrix algebra,
2. perform vector algebra for abstract vector spaces,
3. find inner products and linear transformations for vectors, and
4. compute and use eigenvalues and eigenvectors.

### VI. Course Outline of Topics

Required Topics

1. Introduction to linear systems and techniques for solving linear systems
2. Gaussian elimination and Gauss-Jordan elimination.
3. Operations with matrices
4. Properties of matrix operations
5. The inverse of a matrix

6. Elementary matrices
7. Determinant of a matrix
8. Evaluation of a determinant using elementary operations
9. Properties of determinants
10. Vectors in n-space
11. Vector spaces
12. Subspaces
13. Spanning sets and linear independence
14. Basis and dimension
15. Rank of a matrix
16. Rank and systems of equations
17. Coordinates and change of basis
18. Length and dot product in n-space
19. Inner products and properties
20. Orthonormal base: Gram-Schmidt process
21. Math models and least squares analysis
22. Linear transformations
23. The kernel and range of a linear transformation
24. Matrices for linear transformations
25. Transition matrices and similarity
26. Eigenvalues and eigenvectors
27. Diagonalization
28. Applications of linear algebra

#### Optional Topics

1. Symmetric matrices and orthogonal diagonalization
2. QR decomposition
3. SVD
4. Systems of differential equations

### **VII. Evaluation and Assessment**

Grades will be given based upon A = 90 – 100%, B = 80 – 89%, C = 70 – 79%, D = 60 – 69%, and F = below 60%.

### **VIII. Attendance**

Students are expected to attend all classes for which they are registered. Students who are unable to attend class regularly, regardless of the reason or circumstance, should withdraw from that class before poor attendance interferes with the student's ability to achieve the objectives required in the course. Withdrawal from class can affect eligibility for federal financial aid.

### **IX. Statement on Discrimination/Harassment**

It is the official policy of the Alabama Community College System and entities under its

control, including all Colleges, that no person shall be discriminated against on the basis of any impermissible criterion or characteristic, including, without limitation, race, color, national origin, religion, marital status, disability, sex, age, or any other protected class as defined by federal and state law. (ACCS Policies 601.02 and 800.00)

**X. Americans with Disabilities**

*The Rehabilitation Act of 1973 (Section 504) and the Americans with Disabilities Act of 1990* state that qualified students with disabilities who meet the essential functions and academic requirements are entitled to reasonable accommodations. It is the student's responsibility to provide appropriate disability documentation to the College.