San Bernardino Valley College
Curriculum Approved: May 5, 2003
Last Updated: April 2003

I. COURSE DESCRIPTION:

A. Division: Science and Math
Department: Math
Course ID: MATH 265
Course Title: Linear Algebra
Units: 3
Lecture: 3 Hours
Laboratory: None
Prerequisite: MATH 250 or eligibility for MATH 265 as determined through the SBVC assessment process.

B. Catalog and Schedule Description: An introduction to linear algebra that complements advanced courses in calculus. Topics include systems of linear equations, matrix operations, determinants, vectors and vector spaces. Eigenvalues and eigenvectors and linear transformations.

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: One

III. EXPECTED OUTCOMES FOR STUDENTS:

Upon completion of the course the student should be able to:

A. Solve linear equations with many unknowns;
B. Apply problems and solutions to physical world applications;
C. Know "Linear Modeling" and apply linear algebra to geometric theorems and proofs;
D. Apply Gauss-Jordan Elimination to solve a system of equation;
E. Analyze a word problem and formulate a system of equations from which a solution can be found;
F. Perform the basic operations on matrices;
G. Evaluate determinants and to apply the properties of determinants;
H. Apply the properties of vectors to lines in three dimensions and planes;
I. Recognize the properties of a Vector Space, Subspaces, Linear Combinations, Linear Independence, Basis and Dimension of a vector space;
J. Recognize eigenvalues, eigenvectors and basic linear transformations of the plane.

IV. COURSE CONTENT:

A. Systems of Linear Equations
   1. Gaussian Elimination and Gauss-Jordan Elimination
   2. Applications of Systems of Linear Equations
B. Matrices
   1. Operations with Matrices
   2. Properties of Matrix Operations
   3. The Inverse of a Matrix
   4. Elementary Matrices
   5. Applications of Matrix Operations
C. Determinants
   1. The Determinant of a Matrix
   2. Evaluation of a Deteminant using Elementary Operations
   3. Properties of Determinants
   4. Applications of Determinants

D. Vector Spaces
   1. Vectors in R^n
   2. Vector Spaces
   3. Subspaces of Vector Spaces
   4. Spanning Sets and Linear Independence
   5. Basis and Dimension

6. Rank of a Matrix and Systems of Linear Equations
7. Coordinates and Change of Basis
8. Applications of Vector Spaces

E. Inner Product Spaces
1. Length and Dot Product in R^n
2. Inner Product Spaces
3. Orthonormal Bases: Gram-Schmidt Process
4. Mathematical Models and Least Square Analysis (optional)
5. Applications of Inner Product Spaces

F. Linear Transformations
1. Introduction to Linear Transformations
2. The Kernel and Range of a Linear Transformation
3. Matrices for Linear Transformations
4. Transition Matrices and Similarity (Optional)
5. Applications of Linear Transformations

G. Eigenvalues and Eigenvectors
1. Eigenvalues and Eigenvectors
2. Diagonalization
3. Symmetric Matrics and Orthogonal Diagonalization
4. Applications of Eigenvalues and Eigenvectors

V. METHODS OF INSTRUCTION:

A. Lecture
B. Discussion
C. Collaborative Methods

VI. TYPICAL ASSIGNMENT(S):

A. At the end of each section there is a set of problems. These start with problems that require the student to recognize and apply the principles covered in the section. The problems then graduate into those requiring the application of two or more principles and the student must recognize the principles to apply and the correct order in which to apply the. Typical problem sets end with application problems in which the student must translate the words in the problem into appropriate mathematical symbols, and analyze which principles must be applied. The student must then formulate and apply a solution strategy.

B. Methods of Evaluation:
1. 5 Examinations and 5 quizzes
2. Each student is required to successfully complete a comprehensive final examination

VIII. TYPICAL TEXT(S):

Larson Edwards, Elementary Linear Algebra, fourth edition, Houghton Mifflin, 2000.

IX. OTHER SUPPLIES REQUIRED OF STUDENTS: TI-85/TI-86 calculators