Math 100, Sec _____ Spring 2005

Title: Introduction to Linear Algebra

Description

Catalog: Careful development of matrices, system of equations, determinants, vector spaces, linear transformations, orthogonality, real and complex eigenvalues; R_3 viewed as a vector space with generalization to Rn.. Students will be given periodic writing assignments that will encourage them to think through the concepts of the course.

Course: Math 100 is designed to introduce the concepts of linear algebra from a formal and practical point of view. This encourages an appreciation for abstract structure and logical processes needed to understand and apply the mathematical results of the standard classical topics of linear algebra. Students will be given periodic writing assignments that encourage them to think through concepts of the course

Prerequisites: Math 30 or AP credit for AB calculus in high school.

Learning Objectives: Understand Gaussian elimination method and use this method to solve mxn systems of equations (n,m<6) and to interpret the solution.
Understand the representation of linear transformation as matrices, interpret the elementary matrices as linear transformations, find the matrix representation of expansions, contractions, translations, rotations, reflections, understand the relationship between Gaussian elimination and the elementary matrices, and use elementary matrices to find the inverse of an nxn (n<5) matrix.
Understand and apply the definitions of a subspace, a spanning set, a linearly independent set, a basis, and dimension to R_2 and R_3, understand the connections between these concepts, and generalize these ideas to general vector space.
Find the kernel and range of a linear transformation, understand relationship between the dimension of the kernel and range, find the eigenvalues and eigenvectors of a linear transformation and use the eigenvectors to diagonalize an nxn matrix.

Text: Elementary Linear Algebra (9^{th} ed) by Howard Anton

Coverage: Chapters 1 thru 8

Assignments: A variety of reading and problem solving assignments will be part of the course.

Examinations: There will be three midterm examinations and a comprehensive final examination for this course.
The examination schedule is given below.

Midterm I	Feb. 18
Midterm II	Mar. 18
Midterm III	Apr. 22
Final	May 16

Grading: Written work is scored on the following scale and your grade in this course is assigned according to the following percentages.

Homework	100 (10.0%)	88% - 100%	A
Midterms (150 pts each)	500 (50.0%)	76% - 87%	B
Final	400 (40.0%)	65% - 76%	C
		50% - 64%	D
Total	1000	below 50%	F

Topics Covered – Math 35:

I. Systems of linear equations — 2 Weeks
   a. Introduction
   b. Gaussian Elimination
   c. Homogeneous Systems
   d. Matrices and Matrix Operations
   e. Elementary Matrices
   f. Methods for Finding and Inverse of a Matrix
   g. Further Results on Invertibility

II. Determinants — 2 Weeks
   a. The Determinant Function
   b. Evaluating Determinants by Row Reduction
   c. Properties of the Determinant Function
   d. Cramer's Rule

III. Vectors in 2-Space and 3-Space — 2 Weeks
   a. Norm of a Vector
   b. Dot Product and Projections
   c. Cross Product

IV. Vector Spaces — 3 Weeks
   a. Euclidean n-Space
   b. General Vector Spaces
   c. Subspaces
   d. Linear Independence
   e. Basis and Dimension
   f. Rank of a Matrix

g. Length and Angle in Inner Product Spaces
h. Orthonormal Bases
i. Coordinates: Change of Basis

V. Linear Transformations — 2 Weeks
a. Introduction
b. Properties of Linear Transformations
c. Kernel and Range
d. Matrices of Linear Transformations
e. Similarity

VI. Eigenvalues and Eigenvectors — 3 Weeks
a. Definitions and Properties
b. Diagonalization
c. Orthogonal Diagonalization