MATH 551 Applied Matrix Theory

Required of CS, IE, ME

Catalog Description: (3) I, II, S. Matrix algebra, solutions to systems of linear equations, determinants, vector spaces, linear transformations, eigenvalues, linear programming, approximation techniques.

Prerequisites: MATH 205 or 220.

Textbook: *Linear Algebra, Ideas and Applications,* Richard C. Penney, John Wiley & Sons, 1998, Second Edition.

Course Objectives: This course will serve as an introduction to some of the basic concepts and techniques of matrix theory. These ideas are used throughout mathematics, the sciences, and engineering.

Sessions: Three 50 minute lectures per week and five 50 minute labs per semester.

Chapter	Topics	Sessions
1	The Vector Space of mxn Matrices	2
	Systems	1
	Applications to Circuit Theory	1
	Gaussian Elimination	1
	Applications to Traffic Flow	1
	Lab 1 - Gaussian Elimination	1
	Column Space and Nullspace	2
2	The Test for Linear Independence	1
	Dimension	1
	Applications to Differential Equations	1
	Applications to the Harmonic Oscillator	1
	Lab 2 - Spring Mass Oscillations	1
	Row Space and the Rank-Nullity Theorem	2
3	The Linearity Properties	1
	Matrix Multiplication (Composition)	2
	Lab 3 - Transforming Stick Figures	1
	Inverses	2
	Applications to Economics	1
	The *LU* Factorization	1
	The Matrix of a Linear Transformation	1
	Lab 4 - Matrix Inverses, Error	1
4	Definition of the Determinant	1
	Reduction and Determinants	1
	A Formula for Inverses	1
5	Eigenvectors	1
	Application to Markov Processes	1
	Diagonalization	1
	Complex Eigenvectors	1
6	The Scalar Product in R^n	1
	Projections: The Gram-Schmidt Process	1
	Fourier Series: Scalar Product Spaces	1
	Lab 5 - Fourier Approximations	1
	Orthogonal Matrices	2
	Quadratic Forms: Orthogonal Diagonalization	1
Reviews and Hour Exams		6
Total		46