OFFICIAL SYLLABUS
466 - NUMERICAL LINEAR ALGEBRA WITH APPLICATIONS

Adopted - Spring 2004 (Committee: Drs. C. Lu, G. Pelekanos, E.Sewell)

Catalog Description. Direct and iterative methods for linear systems, approximation of eigenvalues, solution of nonlinear systems, numerical solution of ODE and PDE boundary value problems, function approximation. Prerequisites: MATH 135, 250, 305, 321 CS 140 or 141

Textbook. Numerical Analysis, 8th edition by R. Burden and J. Faires

Course Outline and Topics

Chapter 1: Math Preliminaries

1.2 Roundoff Errors and Computer Arithmetic

Chapter 6: Direct Methods for Solving Linear Systems

6.1 Linear Systems of Equations
6.2 Pivoting Strategies
6.3 Linear Algebra and Matrix Inversion (Optional)
6.4 The Determinant of a Matrix
6.5 Matrix Factorization
6.6 Special Types of Matrices

Chapter 7: Iterative Techniques in Matrix Algebra

7.1 Norms of Vectors and Matrices
7.2 Eigenvalues and Eigenvectors
7.3 Iterative Techniques for Solving Linear Systems
7.4 Error Bounds and Iterative Refinement

Either

Chapter 8: Approximation Theory

8.1 Discrete Least Squares Approximation
8.2 Orthogonal Polynomials and Least Squares Approximation
8.3 Chebyshev Polynomials and Economization of Power Series
8.4 Rational Function Approximation
8.5 Trigonometric Polynomial Approximation

Chapter 9: Approximating Eigenvalues

9.1 Linear Algebra and Eigenvalues
9.2 The Power Method
9.3 Householder's Method
9.4 The QR Algorithm

or

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Chapter 10: Numerical Solutions of Nonlinear Systems of Equations

10.1 Fixed Points for Functions of Several Variables
10.2 Newton's Method
10.4 Steepest Descent Techniques

Chapter ***11: Boundary-Value Problems for Ordinary Differential Equations***

11.3 Finite-Difference Methods for Linear Problems
11.4 Finite-Difference Methods for Nonlinear Problems
11.5 The Rayleigh-Ritz Method, **or**
12.1 Elliptic Partial Differential Equations

Any instructor should cover all of the material specified, additional sections are optional.