**Catalog Description:**
Matrix theory, eigenvectors and eigenvalues, ordinary and partial differential equations.

**Prerequisite:**
2173 and either major in ENG, Physics, or Chemistry or permission of math department.

**Exclusions:**
Not open to students with credit for both (i) 2415 (415) or 2255 (255) and (ii) 2568 (568 or 571).

**Text:**


**Topics List:**

**Part One = Matrix Algebra**
Textbook sections from Arnold, Riess, and Johnson’s *Introduction to Linear Algebra*, 5th edition

- Chapter 1: Matrices and Linear Systems of Equations
- Chapter 3: The Vector Space \( \mathbb{R}^n \)
- Chapter 4: The Eigenvalue Problem

1.1 Introduction and Gaussian Elimination and Systems of Linear Equations
1.2 Echelon Form and Gauss-Jordan Elimination
1.3 Consistent Systems of Linear Equations
1.5 Matrix Operations
1.6 Algebraic Properties of Matrix operations
1.7 Linear Independence and Nonsingular Matrices
1.9 Matrix Inverses and the Properties
3.1-3.2 Review and Vector Space Properties in \( \mathbb{R}^n \)
3.3 Examples of Subspaces
3.4 Basis for Subspaces; Dimension

*Midterm I*
4.1 The Eigenvalue Problem for 2x2 Matrices
4.2 Determinants and the eigenvalue Problem
4.4 Eigenvalues and characteristic Polynomial
4.5 Eigenvectors and Eigenspaces
4.6 Complex Eigenvalues and Eigenvectors
4.7 Similarity Transformations and Diagonalization

Part Two = Systems of Linear Differential Equations
Textbook Sections from Boyce & DiPrima’s *Part II: Elementary Ordinary & Partial Differential Equations*

Ch. 7: Systems of First Order Linear Equations (no lectures, but assigned as an independent class project)

Midterm 2

Part Three = Partial Differential Equations and Fourier Series
Textbook Sections from Boyce & DiPrima’s *Part II: Elementary Ordinary & Partial Differential Equations*

10.1 Two point Boundary Value Problem
10.2 Fourier Series
10.3 The Fourier Convergence Theorem
10.4 Even and Odd Functions
10.5 Separation of Variables; Heat Conduction Equation
10.6 Other Heat Conduction Problems
10.7 The Wave Equation; Vibrations of an Elastic String
10.8 Laplace's Equation (optional)