

UCSB Department of Mathematics
Course Outline
MATH 4B: Differential Equations

The following is a typical outline of MATH 4B at UCSB. Instructors will generally cover the content described here, but the pacing and structure of the course may vary.

(Parentheses indicate sections from the suggested textbook, Elementary Differential Equations and Boundary Value Problems, 11th Ed. by Boyce, DiPrima and Meade.)

Week 1:

- Introductory Ideas, Classification (1.1, 1.3)
- First-Order Linear, Integrating Factor (2.1)
- Separable DE's (2.2)

Week 2:

- Applications (2.3)
- Existence/Uniqueness & Direction Fields (1.1, 2.4, 2.8)
- Linear/Nonlinear and Autonomous Equations (2.4, 2.5)

Week 3:

- Numerical Techniques, Euler's Method (2.7)
- Catch-Up & Review First-Order DE's
- MIDTERM 1

Week 4:

- Second-Order Linear, Two Real Roots (3.1)
- Existence/Uniqueness & Wronskian (3.2)
- Second-Order Linear, Two Imaginary Roots (3.3)

Week 5:

- Second-Order Linear, Repeated Roots (3.4)
- Reduction of Order and Euler Equations (3.4)
- Nonhomogeneous, Undetermined Coefficients (3.5)

Week 6:

- Nonhomogeneous, Variation of Parameters (3.6)
- Applications, Mechanical Vibrations (3.7, 3.8)
- Higher-Order Linear DE's (4.1, 4.2, 4.3)

Week 7:

- Catch-Up & Review Second-Order and Higher DE's
- MIDTERM 2
- Systems of Linear Equations (7.3)

Week 8:

- Systems in Matrix Form, Direction Fields (7.4, 7.5)
- Systems in Matrix Form, Eigenvalues & Eigenvectors (7.3, 7.4)
- Imaginary Eigenvalues (7.6)

Week 9:

- Repeated Eigenvalues (7.8)
- Trajectories in the Phase Plane (9.1)
- Nonhomogeneous Systems (7.9)

Week 10:

- Boundary Value Problems (10.1)
- Boundary Value Problems (11.1)
- Catch-Up & Review for Final Exam