

MATH 262

Applied Differential Equations

This course is restricted to students in the Civil Engineering UBC Bridge Program. It provides an introduction to modern approach to the solution of differential equations often encountered in Science and Engineering.

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Textbook

Dennis G. Zill, *A First Course in Differential Equations with Modeling Applications*, 7th Edition, Brooks/Cole, 2001.

Evaluation

- Three term tests: 40%
- Comprehensive final exam: 60%

Tentative Schedule

Test 1	April 29	Test 2	May 20	Test 3	June 10
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Final exams are held from June 20 - 24. You **must** be available at the scheduled time.

The following percentage conversion to letter grade will be used:

Percentage:	0-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100
Letter grade:	F	D	C	C+	B-	B	B+	A-	A	A+

Course Outline

1. INTRODUCTION TO DIFFERENTIAL EQUATIONS
 - Definitions and Terminology (section 1.1)
 - Initial-Value Problems (section 1.2)
2. FIRST-ORDER DIFFERENTIAL EQUATIONS
 - Separable Variables (section 2.2)
 - Linear Equations (section 2.3)
 - Exact Equations (section 2.4)
 - Solutions by Substitutions (section 2.5)
 - A Numerical Solution (section 2.6)

3. MODELING WITH DIFFERENTIAL EQUATIONS
 - Linear Equations (section 3.1)
 - Nonlinear Equations (section 3.2)
4. DIFFERENTIAL EQUATIONS OF HIGHER-ORDER
 - Preliminary Theory: Linear Equations (section 4.1)
 - Reduction of Order (section 4.2)
 - Homogeneous Linear Equations with Constant Coefficients (section 4.3)
 - Undetermined Coefficients — Superposition Approach (section 4.4)
 - Variation of Parameters (section 4.6)
 - Cauchy-Euler Equations (section 4.7)
 - Solving Systems of Linear Equations by Elimination (section 4.8)
5. MODELING WITH HIGHER-ORDER DIFFERENTIAL EQUATIONS
 - Linear Equations: Initial-Value Problems (section 5.1)
 - Linear Equations: Boundary-Value Problems (section 5.2)
 - Nonlinear Equations (section 5.3)
6. SERIES SOLUTIONS OF LINEAR EQUATIONS
 - Solutions About Ordinary Points (section 6.1)
 - Solutions about Singular Points (section 6.2)
7. LAPLACE TRANSFORMS
 - Definition of the Laplace Transform (section 7.1)
 - Inverse Transform and Transform of Derivatives (section 7.2)
 - Translation Theorems (section 7.3)
 - Additional Operational Properties (section 7.4)
 - Dirac Delta (section 7.5)
8. SYSTEMS OF LINEAR FIRST-ORDER DIFFERENTIAL EQUATIONS
 - Preliminary Theory (section 8.1)
 - Homogeneous Linear Systems with Constant Coefficients (section 8.2)
 - Variation of Parameters (section 8.3)
 - Matrix Exponential (section 8.4)
9. NUMERICAL SOLUTIONS OF ODE
 - Euler Methods and Error Analysis (section 9.1)
 - Runge-Kutta Methods (section 9.2)
 - Multistep Methods (section 9.3)
10. PHASE PLANE ANALYSIS
 - Introduction to Phase Plane Analysis (Handout)