



# Ordinary Differential Equations and Linear Algebra: A Systems Approach

*Todd Kapitula*

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Ordinary differential equations (ODEs) and linear algebra are foundational postcalculus mathematics courses in the sciences. The goal of this text is to help students master both subject areas in a one-semester course. Linear algebra is developed first, with an eye toward solving linear systems of ODEs. A computer algebra system is used for intermediate calculations (Gaussian elimination, complicated integrals, etc.); however, the text is not tailored toward a particular system.

*Ordinary Differential Equations and Linear Algebra: A Systems Approach* systematically develops the linear algebra needed to solve systems of ODEs and includes over 15 distinct applications of the theory, many of which are not typically seen in a textbook at this level (e.g., lead poisoning, SIR models, digital filters). It emphasizes mathematical modeling and contains group projects at the end of each chapter that allow students to more fully explore the interaction between the modeling of a system, the solution of the model, and the resulting physical description.

**Audience:** This book is intended for students who have had one year of calculus and are taking a first class in ODEs.

**Contents:** Preface; Chapter 1: Essentials of linear algebra; Chapter 2: Scalar first-order linear differential equations; Chapter 3: Systems of first-order linear differential equations; Chapter 4: Scalar higher-order linear differential equations; Chapter 5: Discontinuous forcing and the Laplace transform; Chapter 6: Odds and ends; Bibliography; Index.

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