Carmen Chicone
Ordinary Differential Equations with Applications
Third Edition

This book, developed during 20 years of the author teaching differential equations courses at his home university, is designed to serve as a text for a graduate level course focused on the central theory of the subject with attention paid to applications and connections to other advanced topics in mathematics. Core theory includes local existence and uniqueness, the phase plane, Poincaré–Bendixson theory, Lyapunov and linearized stability, linear systems, Floquet theory, the Grobman–Hartman theorem, persistence of rest points and periodic orbits, the stable and center manifold theorems, and bifurcation theory. This edition includes expanded treatment of deterministic chaos, perturbation theory for periodic solutions, boundary value problems, optimization, and a wide range of their applications. In addition, it contains a formulation and new proof of a theorem on instability of rest points in the presence of an eigenvalue with positive real part, and new proofs of differential inequalities and Lyapunov's center theorem. New sections present discussions of global bifurcation, the Crandall–Rabinowitz theorem, and Alekseev's formula. Of particular note is a new chapter on basic control theory, a discussion of optimal control, and a proof of a useful special case of the maximum principle. A key feature of earlier editions, a wide selection of original exercises, is respected in this edition with the inclusion of a wealth of new exercises.

Reviews of the first edition:
"As an applied mathematics text on linear and nonlinear equations, the book by Chicone is written with stimulating enthusiasm. It will certainly appeal to many students and researchers." —F. Verhulst, SIAM Review

"The author writes lucidly and in an engaging conversational style. His book is wide-ranging in its subject matter, thorough in its presentation, and written at a generally high level of generality, detail, and rigor." —D. S. Shafer, Mathematical Reviews