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Soggetti	Statistical physics Mathematical physics Applied mathematics Engineering mathematics System theory Applications of Nonlinear Dynamics and Chaos Theory Mathematical Physics Mathematical and Computational Engineering Mathematical Applications in the Physical Sciences Complex Systems Statistical Physics and Dynamical Systems
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Nota di contenuto	Part 1 - Bifurcation Analysis -- Analytic integrability of some degenerate centers -- Analysis of the Hopf-zero bifurcation and their degenerations in a quasi-Lorenz system -- Normal forms for a class of tridimensional vector fields with free-divergence in its first component -- Takens-Bogdanov bifurcations and resonances of periodic orbits in the Lorenz system -- Part 2 - Wave Equations -- Solitons and vortices in the Nonlinear Dirac Equation -- Stochastic Korteweg - de Vries type equations -- Exact and adiabtic invariants of KdV type equations -- Gravitational waves as nonlinear waves and solitons -- Part 3 - Other Differential and Difference Equations -- On the dynamics of the nonlinear logistic difference equation with two delays -- Simplifying

singular perturbation theory in the canard regime using piecewise-linear (PWL) systems -- Principal solutions and variation of constants formula for a class of functional differential equations -- Diffusion Equations in Inhomogeneous Media from the Master Equation -- Part 4 - Computational Methods -- On the numerical approximation to generalized Ostrovsky equations -- Simulation of Laser Dynamics with Cellular Automata: progress and challenges.

Sommario/riassunto

This book is part of a two volume set which presents the analysis of nonlinear phenomena as a long-standing challenge for research in basic and applied science as well as engineering. It discusses nonlinear differential and differential equations, bifurcation theory for periodic orbits and global connections. The integrability and reversibility of planar vector fields and theoretical analysis of classic physical models are sketched. This first volume concentrates on the mathematical theory and computational techniques that are essential for the study of nonlinear science, a second volume deals with real-world nonlinear phenomena in condensed matter, biology and optics.