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This introduction to dynamical systems theory treats both discrete dynamical systems and continuous systems. Driven by numerous examples from a broad range of disciplines and requiring only knowledge of ordinary differential equations, the text emphasizes applications and simulation utilizing MATLAB®, Simulink®, and the Symbolic Math toolbox.

Beginning with a tutorial guide to MATLAB®, the text thereafter is divided into two main areas. In Part I, both real and complex discrete dynamical systems are considered, with examples presented from population dynamics, nonlinear optics, and materials science. Part II includes examples from mechanical systems, chemical kinetics, electric circuits, economics, population dynamics, epidemiology, and neural networks. Common themes such as bifurcation, bistability, chaos, fractals, instability, multistability, periodicity, and quasiperiodicity run through several chapters. Chaos control and multifractal theories are also included along with an example of chaos synchronization. Some material deals with cutting-edge published research articles and provides a useful resource for open problems in nonlinear dynamical systems.

Approximately 330 illustrations, over 300 examples, and exercises with solutions play a key role in the presentation. Over 60 MATLAB® program files and Simulink® model files are listed throughout the text; these files may also be downloaded from the Internet at: http://www.mathworks.com/matlabcentral/fileexchange/. Additional applications and further links of interest are also available at the author's website.

The hands-on approach of Dynamical Systems with Applications using MATLAB® engages a wide audience of senior undergraduate and graduate students, applied mathematicians, engineers, and working scientists in various areas of the natural sciences.

Reviews of the author's published book Dynamical Systems with Applications using Maple®: