Analytical Routes to Chaos in Nonlinear Engineering

Description: Nonlinear problems are of interest to engineers, physicists and mathematicians and many other scientists because most systems are inherently nonlinear in nature. As nonlinear equations are difficult to solve, nonlinear systems are commonly approximated by linear equations. This works well up to some accuracy and some range for the input values, but some interesting phenomena such as chaos and singularities are hidden by linearization and perturbation analysis. It follows that some aspects of the behavior of a nonlinear system appear commonly to be chaotic, unpredictable or counterintuitive. Although such a chaotic behavior may resemble a random behavior, it is absolutely deterministic.

Analytical Routes to Chaos in Nonlinear Engineering discusses analytical solutions of periodic motions to chaos or quasi-periodic motions in nonlinear dynamical systems in engineering and considers engineering applications, design, and control. It systematically discusses complex nonlinear phenomena in engineering nonlinear systems, including the periodically forced Duffing oscillator, nonlinear self-excited systems, nonlinear parametric systems and nonlinear rotor systems. Nonlinear models used in engineering are also presented and a brief history of the topic is provided.

Key features:
- Considers engineering applications, design and control
- Presents analytical techniques to show how to find the periodic motions to chaos in nonlinear dynamical systems
- Systematically discusses complex nonlinear phenomena in engineering nonlinear systems
- Presents extensively used nonlinear models in engineering

Analytical Routes to Chaos in Nonlinear Engineering is a practical reference for researchers and practitioners across engineering, mathematics and physics disciplines, and is also a useful source of information for graduate and senior undergraduate students in these areas.

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