



Introduction to Mathematical Modeling and Chaotic Dynamics

By Ranjit Kumar Upadhyay, Satteluri R. K. Iyengar

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Introduction to Mathematical Modeling and Chaotic Dynamics focuses on mathematical models in natural systems, particularly ecological systems. Most of the models presented are solved using MATLAB®.

The book first covers the necessary mathematical preliminaries, including testing of stability. It then describes the modeling of systems from natural science, focusing on one- and two-dimensional continuous and discrete time models. Moving on to chaotic dynamics, the authors discuss ways to study chaos, types of chaos, and methods for detecting chaos. They also explore chaotic dynamics in single and multiple species systems. The text concludes with a brief discussion on models of mechanical systems and electronic circuits.

Suitable for advanced undergraduate and graduate students, this book provides a practical understanding of how the models are used in current natural science and engineering applications. Along with a variety of exercises and solved examples, the text presents all the fundamental concepts and mathematical skills needed to build models and perform analyses.

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Editorial Review

Review

"The presentation is so clear that anyone with even a basic mathematical background can study it and get a clear picture. ... Unlike many other similar textbooks, a rich reference section is given at the end of each chapter. The cautious selection of worked out examples and exercises throughout the book is superb. For anyone with previous experience of having run into books in mathematical modeling and chaotic dynamics that rapidly move into advanced mathematical content, the book offers a pleasant recourse at an introductory level and therefore can be very inspirational."

MAA Reviews, December 2014

About the Author

Dr. Ranjit Kumar Upadhyay is a professor in the Department of Applied Mathematics at the Indian School of Mines. He has been teaching applied mathematics and mathematical modeling courses for more than 16 years. He is a member of the American Mathematical Society and the International Society of Computational Ecology, Hong Kong. His research areas include chaotic dynamics of real-world situations, population dynamics for marine and terrestrial ecosystems, disease dynamics, reaction–diffusion modeling, environmental modeling, differential equations, and dynamical systems theory.

Dr. Satteluri R.K. Iyengar is the dean of academic affairs and a professor of mathematics at Gokaraju Rangaraju Institute of Engineering & Technology. He was previously a professor and head of the Department of Mathematics at the Indian Institute of Technology New Delhi. He has been a professor for more than 22 years, has published numerous journal articles, and has been a recipient of several awards. His research areas encompass numerical analysis and mathematical modeling.

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