Applied Mathematical Modelling of Engineering Problems (Applied Optimization)

Natali Hritonenko, Yuri Yatsenko

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The subject of the book is the "know-how" of applied mathematical modelling: how to construct specific models and adjust them to a new engineering environment or more precise realistic assumptions; how to analyze models for the purpose of investigating real life phenomena; and how the models can extend our knowledge about a specific engineering process.

Two major sources of the book are the stock of classic models and the authors' wide experience in the field. The book provides a theoretical background to guide the development of practical models and their investigation. It considers general modelling techniques, explains basic underlying physical laws and shows how to transform them into a set of mathematical equations. The emphasis is placed on common features of the modelling process in various applications as well as on complications and generalizations of models.

The book covers a variety of applications: mechanical, acoustical, physical and electrical, water transportation and contamination processes; bioengineering and population control; production systems and technical equipment renovation. Mathematical tools include partial and ordinary differential equations, difference and integral equations, the calculus of variations, optimal control, bifurcation methods, and related subjects.

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