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BOOK REVIEW: MATHEMATICAL MODELLING by Simon Serovajsky, (2021), Chapman & Hall/Crc.

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Advanced Mathematical Models & Applications is a journal which publishes original scientific results in mathematics by focusing on models and methods, designed to investigate natural and social phenomena and their applications. Thus providing a perfect link between mathematics and the real world. Any mathematical research is carried out through some mathematical models where real problems are converted into some suitable abstract and theoretical schemes, based on logical-mathematical rules, and shortly called models. In this regard, we are very proud to welcome the publication of the book "*Mathematical Modelling*" (Chapman and Hall/CRC, 2021), by Professor Simon Serovajsky, from al-Farabi Kazakh National University (Almaty, Kazakhstan), who is a distinguish member of the Editorial Board of *Advanced Mathematical Models & Applications*.

Noting the main achievements of Simon Serovajsky one should distinguish introduced by him the definitions of the extended operator derivative, extended differentiability of the solution of the nonlinear infinite dimensional systems with respect to parameter without its Gateaux differentiability and extended differentiability of the inverse and implicit operators. He obtained the necessary conditions of optimality for the nonlinear infinite dimensional control systems. His definition of the weakened approximate solution of optimal control problems and definition of the sequential model of systems may be considered as a bold impact in the optimal control theory.

The main purpose of this book is to describe, in a fashionable and simple way, the main steps from a real problem to a pure mathematical model thus leading the reader to a general method for determining a correct mathematical models. Mathematical modeling should be considered as an interdisciplinary topics, involving several competencies and a solid scientific background. So that, in order to achieve the main purpose of this book and to get readers acquainted with modelling, the Author is spreading in several fields of natural science, biology, economics and physics thus starting from various processes, and step by step, formalizing a model. Hence, from the mathematical structure (typically, but not limited to, ordinary and partial differential equations), the Author is driving back the readers to a concrete interpretation of the mathematical structure by a complete and deep the analysis of these differential equations and their consequences on the evolution and properties of the real problem.

The book consists of an introduction and four parts: systems with lumped parameters, systems with distributed-parameter, other types of models, additional part on related problems.

In the introduction, the general principles of mathematical modeling are discussed and their classification is given.

The first part, consisting of eight chapters, is devoted to systems with lumped parameters. Here the Author consider a wide class of dynamical systems described by ordinary differential

equations by focusing on the qualitative and quantitative analysis of such systems. Various problems of physics, chemistry, biology, ecology, medicine, economics, sociology, psychology, and political science are considered as applications.

The second part, consisting of six chapters, deals with distributed-parameter systems described by partial differential equations with applications in physics, chemistry, biology, and economics.

The third part is devoted to other types of models. Different variational principles, discrete systems and stochastic systems associated with various subject areas act as mathematical models here.

The final part contains additional material, in particular, mathematical problems related to the models under consideration, optimal control problems, and issues of identification of mathematical models.

Although this book is spreading through several far away fields of application by proposing various mathematical approaches, there is a unitary scope and a common vision easily observed by the readers from the first page till the last one. The unity of the contents of the book is due to the fact that, on one hand, the same mathematical models can have qualitatively different interpretations related to different subject areas, and, on the other hand, that the same class of phenomena, depending on the situation, can be described by qualitatively different mathematical tools.

The book is not quite ordinary in form. In particular, each chapter includes a lecture, tasks, appendix, and comments. The main material of the chapter is presented in the lecture. The appendix provides additional information that allows the reader to expand their understanding of the subject of research. In the course of the lecture and the appendix, tasks are given with the necessary methodological instructions. The comments provide a literature review on the problem under discussion. Various connections of the plot under consideration with the results of other chapters are described. Some remarks are made that allow a deeper understanding of the material under consideration. In addition, some mathematical transformations from the lecture and the application are taken there. This facilitates the perception of the material by the reader who does not want to go into deep technical details, but provides such an opportunity for the interested reader. Thus, to some extent, it is possible to maintain a balance between the accessibility of the material and mathematical rigor and expand the circle of readers.

The book is aimed at a wide range of readers, both for specialists in various fields who need to apply mathematical methods and computer technology to solve their own practical problems, and for mathematicians involved in solving applied problems. It will certainly be useful to all readers of the journal *Advanced Mathematical Models & Applications* and not only.

References

Serovajsky S. (2022). *Mathematical Modelling*. Chapman & Hall/Crc.

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