Book Reviews

BOOK REVIEWS

G. P. Galdi, R. Rannacher, A. M. Robertson, S. Turek: HEMODYNAMICAL FLOWS. MODELING, ANALYSIS AND SIMULATION. Oberwolfach Seminars, Vol. 37. Birkhäuser-Verlag, Basel-Boston-Berlin, 2008. ISBN 978-3-7643-7805-9, 501 pages, softcover, price EUR 49,90.

The present volume is a collection of six chapters which are based on a series of lectures delivered by Anne M. Robertson (University of Pittsburgh), Giovanni P. Galdi (University of Pittsburgh), Rolf Rannacher (University of Heidelberg) and Stefan Turek (University of Dortmund) at the Oberwolfach Seminar "Hemodynamical Flows: Aspects of Modeling, Analysis and Simulation", during the period November 20–26, 2005.

In the first chapter, *Review of Relevant Continuum Mechanics*, the basic kinematical and dynamical issues that are the foundation of continuum mechanics used in the book are surveyed.

The second chapter *Hemorheology* is dedicated to constitutive models for blood, based on phenomenological considerations. Experimental data on the multiphase properties of blood as well as the relationship between these properties and the mechanical behavior of blood are considered.

The third chapter *Mathematical problems in Fluid Mechanics* discusses some of many topics which are at the foundations of the analysis of models for blood flow, and suggests out directions for future research. Specifically, it focuses on the following three different problems: pipe flow of a Navier-Stokes liquid, flow of non-Newtonian and, in particular, viscoelastic liquids, and liquid-particle interaction.

The fourth chapter *Methods for Numerical Flow Simulation* introduces the computational methods for the simulation of PDE based models of laminar hemodynamical flows.

In the fifth chapter, *Numerics of Fluid-Structure Interaction*, numerical methods for simulating the interaction of viscous liquids with rigid or elastic bodies are described.

The sixth chapter *Numerical Techniques for Multiphase Flow and Liquid-Solid Interaction* discusses numerical methods for simulating multiphase flows with liquid-solid interaction based on the incompressible Navier-Stokes equations combined with constitutive models for nonlinear solids.

Hemodynamics is an area of active current research and this book provides an introduction into the field for graduate students and researchers.

Šárka Nečasová

G. Schay: INTRODUCTION TO PROBABILITY WITH STATISTICAL APPLICATIONS. Birkhäuser-Verlag, Boston-Basel-Berlin, 2007. ISBN 978-0-8176-4497-0, e-ISBN 978-0-8176-4591-5, vii + 314 pages, 44 Figures, 5 Tables, price EUR 34,90.

The present textbook contains the introduction to probability and statistics aimed at non-mathematics graduate and undergraduate students. The material is sufficient for two semesters but after a reasonable reduction could be used also for one semester. The definitions, theorems and proofs are rigorous, nevertheless readily understandable without deeper mathematical knowledge; in particular, the use of linear algebra is nearly completely avoided.

The first four chapters cover algebra of events, combinatorics, the notions of probability and random variable. The fifth chapter is devoted to expectation, variance and moments. The last two chapters describe selected discrete and continuous distributions and the elements of mathematical statistics including sampling and hypotheses testing. The basic tables for normal, t and χ^2 distributions and for Kolmogorov-Smirnov tests are in Appendix I.

However, the most excellent feature of the textbook consists in very numerous examples and exercises. The definitions and theorems are immediately illustrated by commented and solved examples (about 25 per chapter, 177 in all) and every chapter is concluded by exercises (about 50 per chapter, 381 total). The answers and hints for solution of approximately one half of them are presented in Appendix II. The examples and exercises cover a wide spectrum of random phenomena from games over uncertain events of common life to voter pols, properties of random samples from various populations, medical testing etc. Several problems are taken from the current scientific journals on chemistry, psychotherapy, pharmacology etc.

The book can be recommended as deeply premeditated teaching text for students of computer science, engineering, natural and social sciences.

Ivan Saxl

K. Kunisch, G. Leugering, J. Sprekels, F. Tröltzsch (eds.): CONTROL OF COUPLED PARTIAL DIFFERENTIAL EQUATIONS. ISNM International Series of Numerical Mathematics, Vol. 155. Birkhäuser-Verlag, Basel-Boston-Berlin, 2007. ISBN 978-3-7643-7720-5, vii+382 pages, price EUR 99,–.

This volume is a collection of 15 contributions originating from a conference held at the "Mathematisches Forschungsinstitut", Oberwolfach in April 2005. Such topics as feedback-control, optimal control, controllability, stabilization, fluid-structure interactions, control of moving domains, shape optimization and inverse (identification) problems are treated.

The authors consider a broad range of state problems: Navier-Stokes equations and their Oseen or Boussinesq approximations, elliptic and parabolic problems with non-linear boundary conditions, elliptic variational inequalities, St. Venant shallow water equations, and the driving Schrödinger equation. Though only a third of articles include numerical examples, the numerical simulation of the theoretical results is presented via proposals of effective algorithms such as those based on the semi-smooth Newton methods for solving non-linear non-smooth equations in Banach spaces.

The book addresses researchers and graduate students interested in the optimal control of distributed systems governed by partial differential equations and variational inequalities.

Ivan Hlaváček