Fractional Calculus and Waves in Linear Viscoelasticity: An Introduction to Mathematical Models

Author: Francesco Mainardi
Edition: Hardcover
Release: 2010_July
Publisher: Imperial College Press
Format: Hardcover (300 pages)
ISBN 10: 1848163290
ISBN 13: 9781848163294
Price: 71,30€

This monograph provides a comprehensive overview of the author's work on the fields of fractional calculus and waves in linear viscoelastic media, which includes his pioneering contributions on the applications of special functions of the Mittag-Leffler and Wright types. It is intended to serve as a general introduction to the above-mentioned areas of mathematical modeling. The explanations in the book are detailed enough to capture the interest of the curious reader, and complete enough to provide the necessary background material needed to delve further into the subject and explore the research literature given in the huge general bibliography.

This book is likely to be of interest to applied scientists and engineers.

Contents: Essentials of Fractional Calculus; Essentials of Linear Viscoelasticity; Fractional Viscoelastic Models; Waves in Linear Viscoelastic Media: Dispersion and Dissipation; Waves in Linear Viscoelastic Media: Asymptotic Representations; Diffusion and Wave–Propagation via Fractional Calculus; Appendices: The Eulerian Functions; The Bessel Functions; The Error Functions; The Exponential Integral Functions; The Mittag-Leffler Functions; The Wright Functions.

Readership: Graduate and PhD students in applied mathematics, classical physics, mechanical engineering and chemical physics; academic institutions; research centers.
Key Features

- Contains accessible mathematical language for easy understanding
- Features ample examples to reiterate concepts in the book
- Makes extensive use of graphical images
- Includes a large and informative general bibliography for further research

Algebraic Approach to Differential Equations

**Edition:** Hardcover
**Release:** 2010-July
**Publisher:** World Scientific Publishing Company
**Format:** Hardcover (322 pages)
**ISBN 10:** 9814273236
**ISBN 13:** 9789814273237
**Price:** 107,71€

Mixing elementary results and advanced methods, *Algebraic Approach to Differential Equations* aims to accustom differential equation specialists to algebraic methods in this area of interest. It presents material from a school organized by The Abdus Salam International Centre for Theoretical Physics (ICTP), the Bibliotheca Alexandrina, and the International Centre for Pure and Applied Mathematics (CIMPA).


**Readership:** Graduate and postgraduate mathematicians.

Key Features

- One of very few elementary books in this area of mathematics
- Contributions from important mathematicians including Lê Dũng Tráng (ICTP, Trieste, Italy), Bernard Malgrange (Université de Grenoble I, St. Martin d'Hères Cedex, France), Zoghman Mebkhout (Université Paris 7, France) and Bernard Teissier (Institut de Mathématiques de Jussieu, Paris, France)

Mathematical Applications and Modelling: Yearbook 2010, Association of Mathematics Educators

**Edition:** Hardcover
**Release:** 2010-July
Mathematical Applications and Modelling is the second in the series of the yearbooks of the Association of Mathematics Educators in Singapore. The book is unique as it addresses a focused theme on mathematics education. The objective is to illustrate the diversity within the theme and present research that translates into classroom pedagogies.

The book, comprising of 17 chapters, illuminates how application and modelling tasks may help develop the capacity of students to use mathematics in their present and future lives. Several renowned international researchers in the field of mathematical modelling have published their work in the book. The chapters are comprehensive and laden with evidence-based examples for both mathematics educators and classroom teachers. The book is an invaluable contribution towards the emerging field of research in mathematical applications and modelling. It is a must-read for graduate research students and mathematics educators.

Contents:

- **Introduction:**
  - A Prelude to Mathematical Applications and Modelling in Singapore Schools (B Kaur & J Dindyal)

- **Applications and Modelling in Primary School:**
  - Communities of Mathematical Inquiry to Support Engagement in Rich Tasks (G Anthony & R Hunter)
  - Using ICT in Applications of Primary School Mathematics (B Kissane)
  - Application Problems in Primary School Mathematics (K K Yeo, Joseph)
  - Collaborative Problem Solving as Modelling in the Primary Years of Schooling (J Anderson)
  - Word Problems and Modelling in Primary School Mathematics (J Dindyal)
  - Mathematical Modelling in a PBL Setting for Pupils: Features and Task Design (C M Chan, Eric)
  - Initial Experiences of Primary School Teachers with Mathematical Modelling (K E Ng, Dawn)

- **Applications and Modelling in Secondary School:**
  - Why Study Mathematics? Applications of Mathematics in Our Daily Life (B W Yeo, Joseph)
  - Using ICT in Applications of Secondary School Mathematics (B Kissane)
  - Developing Pupils' Analysis and Interpretation of Graphs and Tables Using a Five Step Framework (M Kemp)
  - Theoretical Approaches and Examples for Modelling in Mathematics Education (G Kaiser et al.)
  - Mathematical Modelling in the Singapore Secondary School Mathematics Curriculum (G Balakrishnan et al.)
  - Making Decisions with Mathematics (T L Toh)
  - The Cable Drum — Description of a Challenging Mathematical Modelling Example and a Few Experiences (F Förster & G Kaiser)
  - Implementing Applications and Modelling in Secondary School: Issues for Teaching and Learning (G Stillman)
• Conclusion:
  • Mathematical Applications and Modelling: Concluding Comments (J Dindyal & B Kaur)

Readership: Mathematics educators, research students and mathematics teachers.

Monte Carlo Methods in Mechanics of Fluid and Gas

Authors: Oleg M. Belotserkovskii - Yury IV Khlopkov (Russian Academy of Science)
Edition: Hardcover
Release: 2010-July
Publisher: World Scientific Publishing Company
Format: Hardcover (280 pages)
ISBN 10: 9814282359
ISBN 13: 9789814282352
Price: 102,95€

This book is devoted to analysis of Monte Carlo methods developed in rarefied gas dynamics. Presented is the short history of the development of such methods, described are their main properties, their advantages and deficiencies. It is shown that the contemporary stage in the progress of computational methods cannot be regarded without a complex approach to the preparation of algorithms taking into account all the peculiarities of the problem under consideration, that is, of the physical nature of a process, the mathematical model and the theoretical aspects of computational mathematics and stochastic processes. Thoroughly investigated is the possibility of application of Monte Carlo methods in some kindred areas of science which are non-traditional for the use of statistical modeling (continuous media, turbulence). Considered are the possible directions of development of statistical modeling.

Contents:
  • The Main Equations and Approaches to Solutions of the Problems in Rarefied Gas Dynamics
  • Development of the Numerical Methods of Solution of the Linear Kinetic Equations
  • Methods of Solution of the Nonlinear Problems in Rarefied Gas Dynamics
  • Modeling of the Flow of Continuous Media
  • Solution of the Navier–Stokes Equations (Petrov^{133–139})
  • Studies of the Weakly Perturbed Flows of Rarefied Gas
  • Study of the Flows About Different Bodies in Transitional Regime
  • Determination of the Aerodynamical Characteristics of the Returnable Space Systems (RSS)
  • The Flow About Blunted Bodies with the Addition of Heat
  • The General Models of Description of the Turbulent Flows
  • Studies of the Turbulent Flow of Fluid and Gas
  • The Possible Directions of Development of the Methods of Statistical Study

Readership: Academics and professionals in fluid mechanics.
Ordinal and Relational Clustering
(Interdisciplinary Mathematical Sciences)

Author: Melvin F. Janowitz
Edition: Har/Cdr
Release: 2010-July
Publisher: World Scientific Publishing Company
Format: Hardcover (180 pages)
ISBN 10: 9814287202
ISBN 13: 9789814287203
Price: 59,95€

Most modern textbooks on cluster analysis are written from the standpoint of computer science, which give the background, description and implementation of computer algorithms. This book proclaims several firsts — the first to present a broad mathematical treatment of the subject, the first that illustrates dissimilarities taking values in a poset, and the first to notice the connection with formal concept analysis which is a powerful tool for investigating hidden structures in large data sets.

This book presents the subject from a mathematical viewpoint with careful definitions. All clearly stated axioms are illustrated with concrete examples. New ideas are introduced informally first, and then in a careful, systematic manner. Much of the material has not previously appeared in the literature. It is to be hoped that the book holds promising directive to launch a new research area that is based on graph theory, as well as partially ordered sets. It also suggests the cluster algorithms that can be used for practical applications. The emphasis will be largely on ordinal data and ordinal cluster methods.

Contents:

- Informal Background
- Dissimilarities and Clusters
- Ordinal Data
- Continuity and Ordinal Continuity
- Classification of Monotone Equivariant Cluster Methods
- Clustering Based on Posets
- A New Poset Model

Readership: Graduate students and researchers in mathematics, computer science, statistics, operations research, psychology and biology.