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Mathematics

Principles of Discontinuous Dynamical Systems

Discontinuous dynamical systems have played an important role in both theory and applications during the last several decades. This is still an area of active research and techniques to make the applications more effective are an ongoing topic of interest. Principles of Discontinuous Dynamical Systems is devoted to the theory of differential equations with variable moments of impulses. It introduces a new strategy of implementing an equivalence to systems whose solutions have prescribed moments of impulses and utilizing special topologies in spaces of piecewise continuous functions. The achievements obtained on the basis of this approach are described in this book. The text progresses systematically, by covering preliminaries in the first four chapters. This is followed by more complex material and special topics such as Hopf bifurcation, Devaney’s chaos, and the shadowing property are discussed in the last two chapters.

Due August 2010

2010. XIV, 206 p. 40 illus., 20 in color.
978-1-4419-6580-6 | approx. 73,40 €

Eddy Current Approximation of Maxwell Equations

Theory, Algorithms and Applications

This book deals with the mathematical analysis and the numerical approximation of time-harmonic eddy current problems. It is self-contained and suitable for mathematicians and engineers working in the field, and also accessible for beginners. Depending on the choice of the physical unknowns, these problems are formulated in different variational ways, with specific attention to the topology of the computational domain. Finite elements of nodal or edge type are used for numerical approximation, and a complete analysis of convergence is performed. A specific feature of the book is the emphasis given to saddle-point formulations in terms of the magnetic and electric fields. New results for voltage or current intensity excitation problems are also presented.

Due July 2010

2010. XII, 564 p. 62 illus., 14 in color.
978-1-4419-6262-1 | approx. 109,95 €

Universal Algebraic Logic

Dedicated to the Unity of Science

This book connects logic with algebra. It covers universal logic and the question of what logic is as well as universal algebraic logic and duality theories between the world of logics and the world of algebra. It also discusses algebraic logic proper including algebras of relations of various ranks, Tarski’s cylindric algebras, relation algebras, Halmos’ polyadic algebras and other kinds of algebras of logic. Besides Tarskian algebraization of logics, the book also touches upon category theoretical perspectives. Following the Tarskian tradition, besides the connections between logic and algebra, related logical connections with geometry and eventually spacetime geometry leading up to relativity are also covered. An introductory chapter contains the necessary algebraic basics, this can be used in its own right as a quick introduction to universal algebra.

Due November 2010

978-3-7643-8505-7 | 59,95 €

Pseudodifferential Operators with Applications

Lectures given at the Centro Internazionale Matematico Estivo (C.I.M.E.) held in Bressanone (Bolzano), Italy, June 16-24, 1977


Due October 2010

2011. 250 p. (CIME Summer Schools, 75)
978-3-642-11091-7 | approx. 34,95 €
Mathematically inspired insights.

Mathematical Lives

Protagonists of the Twentieth Century From Hilbert to Willes

Steps forward in mathematics often reverberate in other scientific disciplines, and give rise to innovative conceptual developments or find surprising technological applications. This volume brings to the forefront some of the proponents of the mathematics of the twentieth century, who have put at our disposal new and powerful instruments for investigating the reality around us. The portraits present people who have impressive charisma and wide-ranging cultural interests, who are passionate about defending the importance of their own research, are sensitive to beauty, and attentive to the social and political problems of their times. What we have sought to document is mathematics’ central position in the culture of our day. Space has been made not only for the great mathematicians but also for literary texts, including contributions by two apparent interlopers, Robert Musil and Raymond Queneau, for whom mathematical concepts represented a valuable tool for resolving the struggle between ‘soul and precision.’

More on www.springer.com/978-3-642-13605-4

Due September 2010

2010. 330 p. 100 illus., 50 in color.
978-3-642-13605-4  ▶ approx. 34,95 €

M. Beck, R. Geoghegan

The Art of Proof

Basic Training for Deeper Mathematics

The Art of Proof is designed for a one-semester or two-quarter course. A typical student will have studied calculus (perhaps also linear algebra) with reasonable success. With an artful mixture of chatty style and interesting examples, the student’s previous intuitive knowledge is placed on solid intellectual ground. The topics covered include: integers, induction, algorithms, real numbers, rational numbers, modular arithmetic, limits, and uncountable sets. Methods, such as axiom, theorem and proof, are taught while discussing the mathematics rather than in abstract isolation. Some of the proofs are presented in detail, while others (some with hints) may be assigned to the student or presented by the instructor. The authors recommend that the two parts of the book -- Discrete and Continuous -- be given equal attention. The book ends with short essays on further topics suitable for seminar-style presentation by small teams of students, either in class or in a mathematics club setting. These

arising in type IIB theory during a Calabi-Yau conifold transition, are discussed.

More on www.springer.com/978-3-642-12588-1

Available

2010. XVI, 217 p. (Lecture Notes in Mathematics, 1997)
978-3-642-12588-1 ▶ 44,95 €

C. Bartocci, R. Betti, A. Gueraggio, R. Lucchetti

Mathematical Lives

Protagonists of the Twentieth Century From Hilbert to Willes

Steps forward in mathematics often reverberate in other scientific disciplines, and give rise to innovative conceptual developments or find surprising technological applications. This volume brings to the forefront some of the proponents of the mathematics of the twentieth century, who have put at our disposal new and powerful instruments for investigating the reality around us. The portraits present people who have impressive charisma and wide-ranging cultural interests, who are passionate about defending the importance of their own research, are sensitive to beauty, and attentive to the social and political problems of their times. What we have sought to document is mathematics’ central position in the culture of our day. Space has been made not only for the great mathematicians but also for literary texts, including contributions by two apparent interlopers, Robert Musil and Raymond Queneau, for whom mathematical concepts represented a valuable tool for resolving the struggle between ‘soul and precision.’

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include: continuity, cryptography, groups, complex numbers, ordinal number, and generating functions.

More on www.springer.com/978-1-4419-7022-0

Due August 2010

2010. XXII, 182 p. 46 illus., 23 in color. 
(Undergraduate Texts in Mathematics, )
978-1-4419-7022-0 ► approx. 29,95 €

K. Bezdek

Classical Topics in Discrete Geometry

About the author: Karoly Bezdek received his Dr.rer.nat.(1980) and Habilitation (1997) degrees in mathematics from the Eötvös Loránd University, in Budapest and his Candidate of Mathematical Sciences (1985) and Doctor of Mathematical Sciences (1994) degrees from the Hungarian Academy of Sciences. He is the author of more than 100 research papers and currently he is professor and Canada Research Chair of mathematics at the University of Calgary.

About the book: This multipurpose book can serve as a textbook for a semester long graduate level course giving a brief introduction to Discrete Geometry. It also can serve as a research monograph that leads the reader to the frontiers of the most recent research developments in the classical core part of discrete geometry. Finally, the fortysome selected research problems offer a great chance to use the book as a short problem book aimed at advanced undergraduate and graduate students as well as researchers. The text is centered around four major and by now classical problems in discrete geometry. The first is the problem of densest sphere packings, which has more than 100 years of mathematically rich history. The second major problem is typically quoted under the approximate 50 years old illumination conjecture of V. Boltyanski and H. Hadwiger. The third topic is on covering by planks and cylinders with emphases on the affine invariant version of Tarski’s plank problem, which was raised by T. Bang more than 50 years ago. The fourth topic is centered around the Kneser-Poulsen Conjecture, which also is approximately 50 years old. All four topics witnessed very recent breakthrough results, explaining their major role in this book.

More on www.springer.com/978-1-4419-0599-4

Due July 2010

2010. XIV, 166 p. (CMS Books in Mathematics, )
978-1-4419-0599-4 ► approx. 39,95 €

H. Brezis

Functional Analysis, Sobolev Spaces and Partial Differential Equations

This textbook is a completely revised, updated, and expanded English edition of the important Analyse fonctionnelle (1983). In addition, it contains a wealth of problems and exercises (with solutions) to guide the reader. Uniquely, this book presents in a coherent, concise and unified way the main results from functional analysis together with the main results from the theory of partial differential equations (PDEs).

Although there are many books on functional analysis and many on PDEs, this is the first to cover both of these closely connected topics. Since the French book was first published, it has been translated into Spanish, Italian, Japanese, Korean, Romanian, Greek and Chinese. The English edition makes a welcome addition to this list.

More on www.springer.com/978-0-387-70913-0

Due August 2010

2010. Approx. 455 p. (Universitext, )
978-0-387-70913-0 ► approx. 44,45 €
H. Broer, F. Takens

**Dynamical Systems and Chaos**

Over the last four decades there has been extensive development in the theory of dynamical systems. This book starts from the phenomenological point of view reviewing examples. Hence the authors discuss oscillators, like the pendulum in many variation including damping and periodic forcing, the Van der Pol System, the Henon and Logistic families, the Newton algorithm seen as a dynamical system and the Lorenz and Ressler system are also discussed. The phenomena concern equilibrium, periodic, multi- or quasi-periodic and chaotic dynamics as these occur in all kinds of modeling and are met both in computer simulations and in experiments. The application areas vary from celestial mechanics and economical evolutions to population dynamics and climate variability. The accessible book is aimed at a broad audience of students and researchers. The first four chapters have been used for an undergraduate course in Dynamical Systems and material from the last two chapters and from the appendices has been used for master and PhD courses by the authors. All chapters conclude with an exercise section. One of the challenges is to help applied researchers acquire background for a better understanding of the data that computer simulation or experiment may provide them with the development of the theory. Henk Broer and Floris Takens, professors at the Institute for Mathematics and Computer Science of the University of Groningen are leaders in the field of dynamical systems. They have published a wealth of scientific papers and books in this area and both authors are members of the Royal Netherlands Academy of Arts and Sciences (KNAW).


Due October 2010


C.G. Canuto, A. Tabacco

**Mathematical Analysis II**

The purpose of this textbook is to present an array of topics in Calculus, and conceptually follow our previous effort Mathematical Analysis I. The present material is partly found, in fact, in the syllabus of the typical second lecture course in Calculus as offered in most Italian universities. While the subject matter known as ‘Calculus 1’ is more or less standard, and concerns real functions of real variables, the topics of a course on ‘Calculus 2’ can vary a lot, resulting in a bigger flexibility. For these reasons the Authors tried to cover a wide range of subjects, not forgetting that the number of credits the current programme specifications confers to a second Calculus course is not comparable to the amount of content gathered here. The reminders disseminated in the text make the chapters more independent from one another, allowing the reader to jump back and forth, and thus enhancing the versatility of the book. On the website: [http://calvino.polito.it/canuto-tabacco/analisi2](http://calvino.polito.it/canuto-tabacco/analisi2), the interested reader may find the rigorous explanation of the results that are merely stated without proof in the book, together with useful additional material. The Authors have completely omitted the proofs whose technical aspects prevail over the fundamental notions and ideas. The large number of exercises gathered according to the main topics at the end of each chapter should help the student put his improvements to the test. The solution to all exercises is provided, and very often the procedure for solving is outlined.

More on [www.springer.com/978-3-642-14033-4](http://www.springer.com/978-3-642-14033-4)

Due October 2010

- 2011. XX, 443 p. (Springer Monographs in Mathematics, 0) 978-3-642-14033-4 ▶ 89,95 €

M. Brokate, C. Carstensen, R. Kornhuber, R. Krause

**An Introduction to Analysis, Adaptivity and Multigrid for Variational Inequalities**

Variational inequalities provide the mathematical framework for a variety of nonlinear and non-smooth phenomena in science and engineering. Efficient and reliable solution procedures are closely linked to the mathematics of function spaces and partial differential equations. The main subjects of this book are a posteriori error analysis and convergence of adaptive finite element methods, the treatment of multigrid methods and multilevel methods with solution-dependent multilevel bases. The discussion is centered around some model obstacle and contact problems and based upon introductory sections on the mathematics of variational inequalities and on finite element discretisation including short MATLAB programs.

More on [www.springer.com/978-3-0346-0068-2](http://www.springer.com/978-3-0346-0068-2)

Due July 2010

- 2010. Approx. 180 p. (Oberwolfach Seminars, 42) 978-3-0346-0068-2 ▶ 24,95 €

T. Ceccherini-Silberstein, M. Coornaert

**Cellular Automata and Groups**

Cellular automata were introduced by John von Neumann who used them as models for self-reproducing machines. The authors present a self-contained exposition of the theory of cellular automata on groups and explore its deep connections with recent developments in geometric group theory and other branches of mathematics and theoretical computer science. The topics treated include in particular the Garden of Eden theorem for amenable groups and the Gromov-Weiss surjunctivity theorem as well as the solution of the Kaplansky conjecture on the stable finiteness of group rings for sofic groups. The volume is entirely self-contained, includes more than 300 exercises, and appeals to a large audience including specialists as well as newcomers in the field. Based on the interplay between amenability, geometric and combinatorial group theory, and symbolic dynamics it considers linear cellular automata: this gives applications to the theory of group rings (Kaplansky conjectures on the structure theory of group rings) that have no counterpart in other books on the same topics.

More on [www.springer.com/978-3-642-14033-4](http://www.springer.com/978-3-642-14033-4)

Due October 2010

- 2011. XX, 443 p. (Springer Monographs in Mathematics, 0) 978-3-642-14033-4 ▶ 89,95 €

C. Chiarella, A. Novikov

**Contemporary Quantitative Finance**

**Essays in Honour of Eckhard Platen**

Several contributors to this volume write a series of articles outlining contemporary advances in a number of key areas of mathematical finance such as, optimal control theory applied to finance, interest rate models, credit risk and credit derivatives, use of alternative stochastic processes, numerical solution of equations of mathematical finance, estimation of stochastic processes in finance. The list of authors contains many of the researchers who have made the major contributions to these various areas of mathematical finance. This volume addresses both researchers and profes-
sions in financial institutions, as well as regulators working in the above mentioned fields.

More on www.springer.com/978-3-642-03478-7

Due July 2010

978-3-642-03478-7 ▶ 89,95 €

O. Christensen

Functions, Spaces, and Expansions
Mathematical Tools in Physics and Engineering

This graduate-level textbook is a detailed exposition of key mathematical tools in analysis aimed at students, researchers, and practitioners across science and engineering. Every topic covered has been specifically chosen because it plays a key role outside the field of pure mathematics. Although the treatment of each topic is mathematical in nature, and concrete applications are not delineated, the principles and tools presented are fundamental to exploring the computational aspects of physics and engineering. A central theme of the book is the structure of various vector spaces—most importantly, Hilbert spaces—and expansions of elements in these spaces in terms of bases. Key topics and features include: * More than 150 exercises * Abstract and normed vector spaces * Approximation in normed vector spaces * Hilbert and Banach spaces * General bases and orthonormal bases * Linear operators on various normed spaces * The Fourier transform, including the discrete Fourier transform * Wavelets and multiresolution analysis * B-splines * Sturm–Liouville problems As a textbook that provides a deep understanding of central issues in mathematical analysis, Functions, Spaces, and Expansions is intended for graduate students, researchers, and practitioners in applied mathematics, physics, and engineering. Readers are expected to have a solid understanding of linear algebra, in Rn and in general vector spaces. Familiarity with the basic concepts of calculus and real analysis, including Riemann integrals and infinite series of real or complex numbers, is also required.

More on www.springer.com/978-0-8176-4979-1

Available

2010, XIX, 266 p. 9 illus. (Applied and Numerical Harmonic Analysis, )
978-0-8176-4979-1 ▶ 39,95 €

R. Conti

Calculus of variations, Classical and Modern

Lectures given at the Centro Internazionale Matematico Estivo (C.I.M.E.) held in Bressanone (Bolzano), Italy, June 10–18, 1966


More on www.springer.com/978-3-642-11041-2

Due October 2010

2011, 369 p. (CIME Summer Schools, 39)
978-3-642-11041-2 ▶ approx. 34,95 €

N. Crato

Figuring It Out
Entertaining Encounters with Everyday Math

This is a book of mathematical stories — funny and puzzling mathematical stories. They tell of villains who try to steal secrets, heroes who encode their messages, and mathematicians who spend years on end searching for the best way to pile oranges. There are also stories about highway confusions occurring when the rules of Cartesian geometry are ignored, small-change errors due to ignorance of ancient paradoxes, and mistakes in calendars arising from poor numerical approximations. This book is about the power and beauty of mathematics. It shows mathematics in action, explained in a way that everybody can understand. It is a book for enticing youngsters and inspiring teachers. Nuno Crato is a leading science writer and mathematician, whose entertaining essays have won a number of international awards.

More on www.springer.com/978-3-642-12970-4

Due August 2010

978-3-642-12970-4 ▶ approx. 149,95 €

M. Dehmer

Structural Analysis of Complex Networks

Because of the increasing complexity and growth of real-world networks, their analysis by using classical graph-theoretic methods is oftentimes a difficult procedure. As a result, there is a strong need to combine graph-theoretic methods with mathematical techniques from other scientific disciplines, such as machine learning and information theory, in order to analyze complex networks more adequately. Filling a gap in literature, this self-contained book presents...
Secondly, various index theorems for minimal theorems are derived, and their consequences for the space of solutions to Plateau’s problem are discussed. Special emphasis is given to methods related to the following areas: * Applications to biology, chemistry, linguistics, and data analysis * Graph colorings * Graph polynomials * Information measures for graphs * Metrical properties of graphs * Partitions and decompositions * Quantitative graph measures Structural Analysis of Complex Networks is suitable for a broad, interdisciplinary readership of researchers, practitioners, and graduate students in discrete mathematics, statistics, computer science, machine learning, artificial intelligence, computational and systems biology, cognitive science, computational linguistics, and mathematical chemistry. The book may be used as a supplementary textbook in graduate-level seminars on structural graph analysis, complex networks, or network-based machine learning methods.

More on www.springer.com/978-0-8176-4788-9

Due October 2010

2010. XV, 502 p. 85 illus.
978-0-8176-4788-9 ▶ 129,95 €

Mineral Surfaces

Minimal Surfaces is the first volume of a three volume treatise on minimal surfaces (Grundlehren Nr. 339-341). Each volume can be read and studied independently of the others. The central theme is boundary value problems for minimal surfaces. The treatise is a substantially revised and extended version of the monograph Minimal Surfaces I, II (Grundlehren Nr. 295 & 296). The first volume begins with an exposition of basic ideas of the theory of surfaces in three-dimensional Euclidean space, followed by an introduction of minimal surfaces as stationary points of area, or equivalently, as surfaces of zero mean curvature. The final definition of a minimal surface is that of a nonconstant harmonic mapping $X: \Omega \to \mathbb{R}^3$ which is conformally parametrized on $\Omega \subset \mathbb{R}^2$ and may have branch points. Thereafter the classical theory of minimal surfaces is surveyed, comprising many examples, a treatment of Björling’s initial value problem, reflection principles, a formula of the second variation of area, the theorems of Bernstein, Heinz, Osserman, and Fujimoto. The second part of this volume begins with a survey of Plateau’s problem and of some of its modifications. One of the main features is the possibility of “edge-crawling” along free parts of the boundary. The third chapter deals with a priori estimates for minimal surfaces with partially free boundaries. Here one of the main features is the possibility of “edge-crawling” along free parts of the boundary. The third chapter deals with a priori estimates for minimal surfaces in higher dimensions and for minimizers of singular integrals related to the area functional. In particular, far reaching Bernstein theorems are derived. The second part of the book contains what one might justly call a “global theory of minimal surfaces” as envisioned by Smale. First, the Douglas problem is treated anew by using Teichmüller theory. Secondly, various index theorems for minimal theorems are derived, and their consequences for the space of solutions to Plateau’s problem are discussed. Finally, a topological approach to minimal surfaces via Fredholm vector fields in the spirit of Smale is presented.

More on www.springer.com/978-3-642-11705-3

Due July 2010

2010. XVI, 584 p. (Grundlehren der mathematischen Wissenschaften, 341)
978-3-642-11705-3 ▶ 99,95 €

Regularity of Minimal Surfaces

Regularity of Minimal Surfaces begins with a survey of minimal surfaces with free boundaries. Following this, the basic results concerning the boundary behaviour of minimal surfaces and H-surfaces with fixed or free boundaries are studied. In particular, the asymptotic expansions at interior and boundary branch points are derived, leading to general Gauss-Bonnet formulas. Furthermore, gradient estimates and asymptotic expansions for minimal surfaces with only piecewise smooth boundaries are obtained. One of the main features of free boundary value problems for minimal surfaces is that, for principal reasons, it is impossible to derive a priori estimates. Therefore regularity proofs for non-minimizers have to be based on indirect reasoning using monotonicity formulas. This is followed by a long chapter discussing geometric properties of minimal and H-surfaces such as enclosure theorems and isoperimetric inequalities, leading to the discussion of obstacle problems and of Plateau’s problem for H-surfaces in a Riemannian manifold. A natural generalization of the isoperimetric problem is the so-called thread problem, dealing with minimal surfaces whose boundary consists of a fixed arc of given length. Existence and regularity of solutions are discussed. The final chapter on branch points presents a new approach to the theorem that area minimizing solutions of Plateau’s problem have no interior branch points.

More on www.springer.com/978-3-642-11699-5

Due July 2010

2010. XVII, 668 p. (Grundlehren der mathematischen Wissenschaften, 340)
978-3-642-11699-5 ▶ 99,95 €

Global Analysis of Minimal Surfaces

Many properties of minimal surfaces are of a global nature, and this is already true for the results treated in the first two volumes of the treatise. Part I of the present book can be viewed as an extension of these results. For instance, the first two chapters deal with existence, regularity and uniqueness theorems for minimal surfaces with partially free boundaries. Here one of the main features is the possibility of “edge-crawling” along free parts of the boundary. The third chapter deals with a priori estimates for minimal surfaces in higher dimensions and for minimizers of singular integrals related to the area functional. In particular, far reaching Bernstein theorems are derived. The second part of the book contains what one might justly call a “global theory of minimal surfaces” as envisioned by Smale. First, the Douglas problem is treated anew by using Teichmüller theory. Secondly, various index theorems for minimal theorems are derived, and their consequences for the space of solutions to Plateau’s problem are discussed. Finally, a topological approach to minimal surfaces via Fredholm vector fields in the spirit of Smale is presented.

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2010. XVI, 584 p. (Grundlehren der mathematischen Wissenschaften, 341)
978-3-642-11705-3 ▶ 99,95 €
Analysis and Design of Descriptor Linear Systems

Descriptor linear systems is an important and rich part of the general field of control systems theory. This book provides a systematic development of descriptor linear systems covering two aspects --- analysis and design. The text provides thorough introductions to the theory of continuous-time descriptor linear systems and to the basic results and recent advances in descriptor linear systems theory. Key features of Analysis and Design of Descriptor Linear Systems: • Introduces real-world examples of descriptor linear systems • Provides step-by-step algorithms for important analysis and design problems • Covers both basic and advanced results in the literature of continuous-time descriptor linear systems • Includes three appendices which supply additional relevant materials supporting the content of select chapters in the book. The clear presentation of materials and extensive examples make this book easy to understand by a wide audience and therefore general readers will find this book to be a comprehensive introduction to the theory of descriptor linear systems. Researchers will find a comprehensive description of the most recent results in this theory and students will find a solid introduction and overview to some important problems in linear systems theory.

More on www.springer.com/978-1-4419-6396-3
Due October 2010
2010. XII, 672 p. 3 illus. (Springer Monographs in Mathematics, 0)
978-1-4419-6396-1 ► approx. 99,95 €

Recent Trends in Toeplitz and Pseudodifferential Operators

R.V. Duduchava, I. Gohberg, S.M. Grudsky, V. Rabinovich

Recent Trends in Toeplitz and Pseudodifferential Operators

The Nikolai Vasilevskii Anniversary Volume

The aim of the book is to present new results in operator theory and its applications. In particular, the book is devoted to operators with automorphic symbols, applications of the methods of modern operator theory and differential geometry to some problems of theory of elasticity, quantum mechanics, hyperbolic systems of partial differential equations with multiple characteristics, Laplace-Beltrami operators on manifolds with singular points. Moreover, the book comprises new results in the theory of Wiener-Hopf operators with oscillating symbols, large hermitian Toeplitz band matrices, commutative algebras of Toeplitz operators, and discusses a number of other topics.

More on www.springer.com/978-3-0346-0547-2
Available
978-3-0346-0547-2 ► 109,95 €

Concrete Functional Calculus

Concrete Functional Calculus focuses primarily on differentiability of some nonlinear operators on functions or pairs of functions, including composition of two functions, and the product integral, taking a matrix- or operator-valued coefficient function into a solution of a system of linear differential equations with the given coefficients. Key features and topics: * Extensive usage of p-variation of functions * Applications to stochastic processes. This work will serve as a thorough reference on its main topics for researchers and graduate students with a background in real analysis and, for Chapter 12, in probability.

More on www.springer.com/978-1-4419-6949-1
Due August 2010
2010. XII, 727 p. (Universitext, 0)
978-1-4419-6949-1 ► approx. 44,45 €

Vitushkin’s Conjecture for Removable Sets

Vitushkin’s conjecture, a special case of Painlevé’s problem, states that a compact subset of the complex plane with finite linear Hausdorff measure is removable for bounded analytic functions if and only if it intersects every rectifiable curve in a set of zero arclength measure. Chapters 6-8 of this carefully written text present a major recent accomplishment of modern complex analysis, the affirmative resolution of this conjecture. Four of the five mathematicians whose work solved Vitushkin’s conjecture have won the prestigious Salem Prize in analysis. Chapters 1-3 of this book provide important background material on removability, analytic capacity, Hausdorff measure, arclength measure, and Garabedian duality that will appeal to many analysts with interests independent of Vitushkin’s conjecture. The fourth chapter contains a proof of Denjoy’s conjecture that employs Melnikov curvature. A brief postscript reports on a deep theorem of Tolsa and its relevance to going beyond Vitushkin’s conjecture. Although standard notation is used throughout, there is a symbol glossary at the back of the book for the reader’s convenience. This text can be used for a topics course or seminar in complex analysis. To understand it, the reader should have a firm grasp of basic real and complex analysis.

More on www.springer.com/978-1-4419-6708-4
Available
2010. XII, 272 p. (Universitext, 0)
978-1-4419-6708-4 ► approx. 44,45 €

Lévy Matters I

Recent Progress in Theory and Applications

Foundations, Trees and Numerical Issues in Finance

This is the first volume of a subseries of the Lecture Notes in Mathematics called Lévy Matters, which will appear randomly over the next years. Each volume will describe some important topic in the theory or applications of Lévy processes and pay tribute to the state of the art of this rapidly evolving subject with special emphasis on the non-Brownian world. The three expository articles of this first volume have been chosen to reflect the breadth of the area of Lévy processes. The first article by Ken-iti Sato characterizes extensions of the class of selfdecomposable distributions on R^d. The second article by Thomas Duquesne discusses Hausdorff and packing measures of stable trees. The third article by Oleg Reichmann and Christoph Schwab presents numerical solutions to Kolmogorov equations, which arise for instance in...
financial engineering, when Lévy or additive processes model the dynamics of the risky assets.

More on www.springer.com/978-3-642-14006-8

Due August 2010

2010. XVI, 195 p. (Lecture Notes in Mathematics, 2001)
978-3-642-14006-8 ► 44,95 €

M. Elad

Sparse and Redundant Representations
From Theory to Applications in Signal and Image Processing

The field of sparse and redundant representation modeling has gone through a major revolution in the past two decades. This started with a series of algorithms for approximating the sparsest solutions of linear systems of equations, later to be followed by surprising theoretical results that guarantee these algorithms’ performance. With these contributions in place, major barriers in making this model practical and applicable were removed, and sparsity and redundancy became central, leading to state-of-the-art results in various disciplines. One of the main beneficiaries of this progress is the field of image processing, where this model has been shown to lead to unprecedented performance in various applications. This book provides a comprehensive view of the topic of sparse and redundant representation modeling, and its use in signal and image processing. It offers a systematic and ordered exposure to the theoretical foundations of this data model, the numerical aspects of the involved algorithms, and the signal and image processing applications that benefit from these advancements. The book is well-written, presenting clearly the flow of the ideas that brought this field of research to its current achievements. It avoids a succession of theorems and proofs by providing an informal description of the analysis goals and building this way the path to the proofs. The applications described help the reader to better understand advanced and up-to-date concepts in signal and image processing.

Written as a text-book for a graduate course for engineering students, this book can also be used as an easy entry point for readers interested in stepping into this field, and for others already active in this area that are interested in expanding their understanding and knowledge. The book is accompanied by a Matlab software package that reproduces most of the results demonstrated in the book. A link to the free software is available on springer.com.

More on www.springer.com/978-1-4419-7010-7

Due September 2010

2010. XIV, 366 p. 161 illus., 41 in color.
978-1-4419-7010-7 ► approx. 56,95 €

K.D. Elworthy, Y. LeJan, X. Li

The Geometry of Filtering

The geometry is the topic of this book is that determined by a map of one space N onto another, M, mapping a diffusion process, or operator, on N to one on M. Filtering theory is the science of obtaining or estimating information about a system from partial and possibly flawed observations of it. The system itself may be random, and the flaws in the observations can be caused by additional noise. In this volume the randomness and noises will be of Gaussian white noise type so that the system can be modelled by a diffusion process; that is it evolves continuously in time in a Markovian way, the future evolution depending only on the present situation. This is the standard situation of systems governed by its type stochastic differential equations. The state space will be the smooth manifold, N, possibly infinite dimensional, and the “observations” will be obtained by a smooth map onto another manifold, N, say. We emphasise that the geometry is important even when both manifolds are Euclidean spaces. This can also be viewed from a purely partial differential equations viewpoint as one smooth second order elliptic partial differential operator lying above another, both with no zero order term. We consider the geometry of this situation with special emphasis on situations of geometric, stochastic analytic, or filtering interest. The most well studied case is of one Brownian motion being mapped to another with a consequent skew product decomposition (or equivalently the case of Riemannian submersions). This sort of decomposition is generalised and a key to the rest of the book. It is used to study in particular, classical filtering, (semi-)connections determined by stochastic flows, and generalised Weitzenbock formulae.

More on www.springer.com/978-3-0346-0175-7

Due October 2010

2010. 170 p. (Frontiers in Mathematics, )
978-3-0346-0175-7 ► 29,95 €

G.B. Ermentrout, D.H. Terman

Mathematical Foundations of Neuroscience

This book applies methods from nonlinear dynamics to problems in neuroscience. It uses modern mathematical approaches to understand patterns of neuronal activity seen in experiments and models of neuronal behavior. The intended audience is researchers interested in applying mathematics to important problems in neuroscience, and neuroscientists who would like to understand how to create models, as well as the mathematical and computational methods for analyzing them. The authors take a very broad approach and use many different methods to solve and understand complex models of neurons and circuits. They explain and combine numerical, analytical, dynamical systems and perturbation methods to produce a modern approach to the types of model equations that arise in neuroscience. There are extensive chapters on the role of noise, multiple time scales and spatial interactions in generating complex activity patterns found in experiments. The early chapters require little more than basic calculus and some elementary differential equations and can form the core of a computational neuroscience course. Later chapters can be used as a basis for a graduate class and as a source for current research in mathematical neuroscience. The book contains a large number of illustrations, chapter summaries and hundreds of exercises which are motivated by issues that arise in biology, and involve both computation and analysis.

Bard Ermentrout is Professor of Computational Biology and Professor of Mathematics at the University of Pittsburgh. David Terman is Professor of Mathematics at the Ohio State University.


Due July 2010

2010. 390 p. 200 illus. in color. (Interdisciplinary Applied Mathematics, 35)
978-0-387-87707-5 ► 59,95 €

E. Evangelisti

Controllability and Observability

Lectures given at the Centro Internazionale Matematico Estivo (C.I.M.E.) held in Pontecchio (Bologna), Italy, July 1-9, 1968

Lectures: R.E. Kalman: Lectures on controllability and observability.- E. Kulikowski: Controllability and

More on www.springer.com/978-3-642-11062-7
Due October 2010
2011. 289 p. (CIME Summer Schools, 46)
978-3-642-11062-7  ► approx. 34,95 €

W. Ewald, W. Sieg

David Hilbert's Lectures on the Foundations of Arithmetic and Logic 1917-1933

The core of Volume 3 consists of lecture notes for seven sets of lectures Hilbert gave (often in collaboration with Bernays) on the foundations of mathematics between 1917 and 1926. These texts make possible for the first time a detailed reconstruction of the rapid development of Hilbert's foundational thought during this period, and show the increasing dominance of the metamathematical perspective in his logical work: the emergence of modern mathematical logic; the explicit raising of questions of completeness, consistency and decidability for logical systems; the investigation of the relative strengths of various logical calculi; the birth and evolution of proof theory, and the parallel emergence of Hilbert's finitist standpoint. The lecture notes are accompanied by numerous supplementary documents, both published and unpublished, including a complete version of Bernays's Habilitationsschrift of 1918, the text of the first edition of Hilbert and Ackermann's Grundzüge der theoretischen Logik (1928), and several shorter lectures by Hilbert from the later 1920s. These documents, which provide the background to Hilbert and Bernays's monumental Grundlagen der Mathematik (1934, 1938), are essential for understanding the development of modern mathematical logic, and for reconstructing the interactions between Hilbert, Bernays, Brouwer, and Weyl in the philosophy of mathematics.

More on www.springer.com/978-3-540-20578-4
Due July 2010
978-3-540-20578-4  ► 89,95 €

J. Falmagne, J. Doignon

Learning Spaces
Interdisciplinary Applied Mathematics

Learning spaces offer a rigorous mathematical foundation for various practical systems of knowledge assessment. An example is offered by the ALEKS system (Assessment and LEarning in Knowledge Spaces), a software for the assessment of mathematical knowledge. From a mathematical standpoint, learning spaces as well as knowledge spaces (which made the title of the first edition) generalize partially ordered sets. They are investigated both from a combinatorial and a stochastic viewpoint. The results are applied to real and simulated data. The book gives a systematic presentation of research and extends the results to new situations. It is of interest to mathematically oriented readers in education, computer science and combinatorics at research and graduate levels. The text contains numerous examples and exercises, and an extensive bibliography.

More on www.springer.com/978-3-642-01038-5
Due October 2010
2011. XVIII, 417 p. 60 illus., 30 in color.
978-3-642-01038-5  ► 99,95 €

H. Fischer

History of the Central Limit Theorem
From Laplace to Donsker

This study aims to embed the history of the central limit theorem within the history of the development of probability theory from its classical to its modern shape, and, more generally, within the corresponding development of mathematics. The history of the central limit theorem is not only expressed in light of "technical" achievement, but is also tied to the intellectual scope of its advancement. The history starts with Laplace's 1810 approximation to distributions of linear combinations of large numbers of independent random variables and its modifications by Poisson, Dirichlet, and Cauchy, and it proceeds up to the discussion of limit theorems in metric spaces by Donsker and Mourier around 1950. This self-contained exposition additionally describes the historical development of analytical probability theory and its tools, such as characteristic functions or moments. The importance of historical connections between the history of analysis and the history of probability theory is demonstrated in great detail. With a thorough discussion of mathematical concepts and ideas of proofs, the reader will be able to understand the mathematical details in light of contemporary development. Special terminology and notions of probability and statistics are used in a modest way and explained in historical context.

More on www.springer.com/978-0-387-87856-0
Due September 2010
2010. Approx. 380 p. 16 illus. (Sources and Studies in the History of Mathematics and Physical Sciences, )
978-0-387-87856-0  ► approx. 99,35 €
book is intended for advanced undergraduates and graduate students, but may also be used as a reference by academics and professionals in mathematics and the applied sciences.

Due July 2010

2010. XVII, 402 p. 10 illus., 5 in color. (Springer Undergraduate Texts in Mathematics and Technology.)
978-0-387-78976-7 ▶ 59.95 €

Handbook of Geomathematics

During the last three decades geosciences and geoengineering were influenced by two essential scenarios: First, the technological progress has changed completely the observational and measurement techniques. Modern high speed computers and satellite based techniques are entering more and more all geosciences. Second, there is a growing public concern about the future of our planet, its climate, its environment, and about an expected shortage of natural resources. Mathematics concerned with geoscientific problems, i.e., Geomathematics, is becoming increasingly important. The ‘Handbook of Geomathematics’ as a central reference work in this area comprises the following scientific fields: (I) observational and measurement key technologies; (II) modelling of the system Earth (geosphere, cryosphere, hydrosphere, atmosphere, biosphere); (III) analytic, algebraic, and operator-theoretic methods; (IV) statistical and stochastic methods; (V) computational and numerical analysis methods; (VI) historical background and future perspectives.

More on www.springer.com/978-1-4419-6593-6
Due July 2010

2010. XVII, 402 p. 10 illus., 5 in color. (Springer Optimization and Its Applications, 42)
978-1-4419-6593-6 ▶ approx. 129.95 €

G. Geymonat

Constructive Aspects of Functional Analysis

Lectures given at the Centro Internazionale Matematico Estivo (C.I.M.E.) held in Erice (Trapani), Italy, June 27–July 7, 1971

More on www.springer.com/978-3-642-10982-9
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2011. 854 p. (CIME Summer Schools, 57) 978-3-642-10982-9 ▶ approx. 44,95 €

D. Graffi

Materials with Memory
Lectures given at the Centro Internazionale Matematico Estivo (C.I.M.E.) held in Bressanone (Bolzano), Italy, June 3-11, 1977
More on www.springer.com/978-3-642-11095-5
Due October 2010
2011. 295 p. (CIME Summer Schools, 74) 978-3-642-11095-5 ▶ approx. 34,95 €

G. Grioli

Stereodynamics
Lectures given at the Centro Internazionale Matematico Estivo (C.I.M.E.) held in Bressanone (Bolzano), Italy, June 2-12, 1971
More on www.springer.com/978-3-642-10990-4
Due October 2010
2011. 333 p. (CIME Summer Schools, 56) 978-3-642-10990-4 ▶ approx. 34,95 €

M. Grötschel, K. Lucas, V. Mehrmann

Production Factor Mathematics
Mathematics as a production factor or driving force for innovation? Those, who want to know and understand why mathematics is deeply involved in the design of products, the layout of production processes and supply chains will find this book an indispensable and rich source. Describing the interplay between mathematics and engineering sciences the book focusses on questions like - How can mathematics improve to the improvement of technological processes and products - What is happening already? - Where are the deficits? - What can we expect for the future? 19 articles written by mixed teams of authors of engineering, industry and mathematics offer a fascinating insight of the interaction between mathematics and engineering.
More on www.springer.com/978-3-642-11247-8
Due July 2010
2010. 10 p. 978-3-642-11247-8 ▶ 59,95 €

A.K. Gupta, W. Zeng, Y. Wu

Probability and Statistical Models
Foundations for Problems in Reliability and Financial Mathematics
With an emphasis on models and techniques, this textbook introduces many of the fundamental concepts of stochastic modeling that are now a vital component of almost every scientific investigation. These models form the basis of well-known parametric lifetime distributions such as exponential, Weibull, and gamma distributions, as well as change-point and mixture models. The authors also consider more general notions of non-parametric lifetime distribution classes. In particular, emphasis is placed on laying the foundation for solving problems in reliability, insurance, finance, and credit risk. Exercises and solutions to selected problems accompany each chapter in order to allow students to explore these foundations. The key subjects covered include: * Exponential distributions and the Poisson process * Parametric lifetime distributions * Non-parametric lifetime distribution classes * Multivariate exponential extensions * Association and dependence * Renewal theory * Problems in reliability, insurance, finance, and credit risk This work differs from traditional probability textbooks in a number of ways. Since no measure theory knowledge is necessary to understand the material and coverage of the central limit theorem and normal theory related topics has been omitted, the work may be used as a single-semester senior undergraduate or first-year graduate textbook as well as in a second course on probability modeling. Many of the chapters that examine central topics in applied probability can be read independently, allowing both instructors and readers extra flexibility in their use of the book. Probability and Statistical Models is for a wide audience including advanced undergraduate and beginning-level graduate students, researchers, and practitioners in mathematics, statistics, engineering, and economics.
More on www.springer.com/978-0-8176-4986-9
Due August 2010
2010. XVI, 296 p. 978-0-8176-4986-9 ▶ approx. 44,95 €
Wasan took its roots from the Chinese tradition of mathematics and shared its language and its categories of problems, but gave it a new impetus, transforming the Chinese algebraic method of the "heavenly element" into a powerful tool with a much wider scope. All domains of mathematical research were revisited in the light of this new algebra. This book focuses on the first period of the development of wasan. It offers a survey of the earliest manuals for learning the use of the abacus published in the seventeenth century, notably the famous Jinkoki, which counted among the bestsellers of the Tokugawa period. The works of the two greatest mathematicians of this period, Seki Takakazu and Takebe Katahiro, and the way they transformed the face of mathematics, are examined in detail, with particular emphasis on the historical context, the relations between these two mathematicians and the political leaders of the epoch, and the role that mathematics played in this rapidly rising society.

More on www.springer.com/978-3-7643-8744-0

Due July 2010

978-3-7643-8744-0 ► 199,00 €

S. Kalliadasis, C. Ruyer-Quil, B. Scheid, M.G. Velarde

Film Flows, Wave Instabilities and Thermocapillarity

This research monograph gives a detailed review of the state-of-the-art theoretical methodologies for the analysis of dissipative wave dynamics and pattern formation on the surface of a film falling down a planar, inclined substrate. This prototype is an open-flow hydrodynamic instability representing an excellent paradigm for the study of complexity in active nonlinear media with energy supply, dissipation and dispersion. Whenever possible, the link between theory and experiments is illustrated and the development of order-of-magnitude estimates and scaling arguments is used to facilitate the understanding of the underlying basic physics. It will be of benefit to a variety of readers, including advanced graduate students interested in interfacial fluid mechanics, researchers working on the theoretical and experimental aspects of thin film flows, and engineers whose work involves thin films, either isothermal or heated.


Due July 2010

978-1-84882-366-2 ► approx. 55,00 €

G.O. Katona, A. Schrijver, T. Szőnyi

Fete of Combinatorics and Computer Science

Discrete Mathematics and theoretical computer science are closely linked research areas with strong impacts on applications and various other scientific disciplines. Both fields deeply cross fertilize each other. One of the persons who particularly contributed to building bridges between these and many other areas is László Lovász, whose outstanding scientific work has defined and shaped many research directions in the past 40 years. A number of friends and colleagues, all top authorities in their fields of expertise gathered at the two conferences in August 2008 in Hungary, celebrating Lovász’ 60th birthday. It was a real fete of combinatorics and computer science. Some of these plenary speakers submitted their research or survey papers prior to the conferences. These are included in the volume “Building Bridges”. The other speakers were able to finish their contribution only later, these are collected in the present volume.

More on www.springer.com/978-3-642-13579-8

Due August 2010

2010. 450 p. (Bolyai Society Mathematical Studies, 20)
978-3-642-13579-8 ► 109,95 €

G. Kemper

A Course in Commutative Algebra

This textbook offers a thorough, modern introduction into commutative algebra. It is intended mainly to serve as a guide for a course of one or two semesters, or for self-study. The carefully selected subject matter concentrates on the concepts and results at the center of the field. The book maintains a constant view on the natural geometric context, enabling the reader to gain a deeper understanding of the material. Although it emphasizes theory, three chapters are devoted to computational aspects. Many illustrative examples and exercises enrich the text.

More on www.springer.com/978-3-642-03544-9

Due September 2010

2010. 236 p. (Graduate Texts in Mathematics, 256)
978-3-642-03544-9 ► 49,95 €

J.R. Klauder

A Modern Approach to Functional Integration

This text takes advantage of recent developments in the theory of path integration to provide an improved treatment of quantization of systems that either have
no constraints or instead involve constraints with demonstratively improved procedures. Strong emphasis is placed on the coherent state form of the path integral, which typically is only briefly mentioned in the textbook literature. Also of prime importance, a key focus of the book will be on the projection operator method of enforcing quantum constraints. Additionally, several novel proposals are introduced to deal with highly singular quantum field theories. The modern treatment used by the author is an attempt to make a major paradigm shift in how the art of functional integration is practiced. The techniques developed in the work will prove valuable to graduate students and researchers in physics, chemistry, mathematical physics, and applied mathematics who find it necessary to deal with solutions to wave equations, both quantum and beyond. Key topics and features: * A thorough grounding in the Gold Standard of path integrals: the Wiener measure * Formulation of all path integral construction from abstract principles * A review of coherent state fundamentals * A critical comparison of the several path integral versions with emphasis on the virtues of the coherent state version * A construction of the Wiener-measure regularized phase space path integral, its emergence as a coherent state path integral, and its superior definition and connection to the classical theory underlying the quantization * A review of classical and quantum constraints and some of their traditional treatments * Introduction of the projection operator method to deal with quantum constraints, its many virtues as compared to traditional methods, and how it can be incorporated into a conventional or coherent state phase space path integral * An extension of the book’s principal discussion into the realm of quantum field theory with a special emphasis on highly singular examples A Modern Approach to Functional Integration offers insight into these contemporary research topics, which may lead to improved methods and results that cannot be found elsewhere in the textbook literature. Exercises are included in most chapters, making the book suitable for a one-semester graduate course on functional integration; prerequisites consist mostly of some basic knowledge of quantum mechanics.

Due October 2010
2010. XVI, 280 p. 9 illus.
978-0-8176-4790-2 ► approx. 44,95 €

U.H. Kortenkamp, J. Richter-Gebert
The Cinderella.2 Manual
Cinderella.2, the new version of the well-known interactive geometry software, has become an even more versatile tool than its predecessor. The geometry component extends the functionality to such spectacular objects as dynamic fractals, and the software includes two major new components: physical simulation such as of mechanical objects, virtual electronic devices, and electromagnetic properties. Cinderella.2 Documentation is the first book to offer complete instructions and techniques for using Cinderella.2, including the new components feature algorithms via a specially developed scripting language, which interacts smoothly with the geometry and physics components. Cinderella.2 is Math in Motion all the way, and this book provides comprehensive documentation from start to finish.

More on www.springer.com/978-3-540-34924-2
Due October 2010
2010. 188 p. (Algebra and Applications, 11)
978-1-84882-241-2 ► approx. 60,00 €

M. Knebusch
Specialization of Quadratic and Symmetric Bilinear Forms
The specialization theory of quadratic and symmetric bilinear forms over fields and the subsequent generic splitting theory of quadratic forms were invented by the author in the mid-1970’s. They came to fruition in the ensuing decades and have become an integral part of the geometric methods in quadratic form theory. This book comprehensively covers the specialization and generic splitting theories. These theories, originally developed mainly for fields of characteristic different from 2, are explored here without this restriction. In this book, a quadratic form # over a field of characteristic 2 is allowed to have a big quasilinear part QL(#) (defined as the restriction of # to the radical of the bilinear form associated to #), while in most of the literature QL(#) is assumed to have dimension at most 1. Of course, in nature, quadratic forms with a big quasilinear part abound. In addition to chapters on specialization theory, generic splitting theory and their applications, the book’s final chapter contains research never before published on specialization with respect to quadratic places and will provide the reader with a glimpse towards the future.

Due September 2010
2010. 188 p. (Algebra and Applications, 11)
978-1-84882-241-2 ► approx. 60,00 €

Second Order Differential Equations
Special Functions and Their Classification
Second Order Differential Equations presents a classical piece of theory concerning hypergeometric special functions as solutions of second-order linear differential equations. The theory is presented in an entirely self-contained way, starting with an introduction of the solution of the second-order differential equations and then focusing on the systematic treatment and classification of these solutions. Each chapter contains a set of problems which help reinforce the theory. Some of the preliminaries are covered in appendices at the end of the book, one of which provides an introduction to Poincaré-Perron theory, and the appendix also contains a new way of analyzing the asymptomatic behavior of solutions of differential equations. This textbook is appropriate for advanced undergraduate and graduate students in Mathematics, Physics, and Engineering interested in Ordinary and Partial Differential Equations. A solutions manual is available online.

More on www.springer.com/978-1-4419-7019-0
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Due October 2010
2010. 188 p. (Algebra and Applications, 11)
978-1-84882-241-2 ► approx. 60,00 €

Y. Lai, T. Tél
Transient Chaos
This book represents the first comprehensive treatment of Transient Chaos. It gives an overview, based on the results of nearly three decades of intensive research, of transient chaos. One special emphasis is on the applicability of transient chaos, and the fact that certain interesting dynamical phenomena can be understood only in the framework of transient chaos. Specific topics treated include basic concepts and characterization of transient chaos, crises, fractal basin boundaries, chaotic scattering, noise-induced chaos, chaotic advections and the spreading of pollutants in fluid flows, quantum chaotic scattering, spatiotemporal chaotic transients and turbulence, controlling transient chaos, and analysis of transient chaotic time series, etc. Materials included in the book reflect the most recent advances in the field. Case studies and examples are included in each chapter with relevant experimental evidence wherever
Introduction to Quantum Groups

The quantum groups discussed in this book are the quantized enveloping algebras introduced by Drinfeld and Jimbo in 1985, or variations thereof. It is shown that these algebras have natural integral forms which can be specialized at roots of 1 and yield new objects which include quantum versions of the semi-simple groups over fields of positive characteristic. The theory of quantum groups has led to a new, extremely rigid structure, in which the objects of the theory are provided with canonical basis with rather remarkable properties. The book contains an extensive treatment of the theory of canonical bases in the framework of perverse sheaves. The theory developed in the book includes the case of quantum affine enveloping algebras and, more generally, the quantum analogs of the Kac—Moody Lie algebras. This book will be of interest to mathematicians working in the representation theory of Lie groups and Lie algebras, knot theorists and to theoretical physicists and graduate students. Since large parts of the book are independent of the theory of perverse sheaves, the book could also be used as a text book.

Due February 2011
1993. (Modern Birkhäuser Classics, )
978-0-8176-4716-2 ◄ approx. 34,90 €

Mathematical Modeling of Collective Behavior in Socio-Economic and Life Sciences

Mathematical modeling using dynamical systems and partial differential equations is now playing an increasing role in the understanding of complex multi-scale phenomena. Behavior in seemingly different areas such as sociology, economics, and the life sciences can be described by closely related models. Systems made out of a large enough number of individual members can be said to exhibit a collective behavior, from which insight can be gathered in a way that real-life experiments cannot. Using examples from financial markets and modern warfare to the flocking of birds and the swarming of bacteria, the collected research in this volume demonstrates the common methodological approaches and tools for modeling and simulating collective behavior. Specific topics covered include: * analysis of wealth distributions * dynamics of price formation * spreading of opinions * models of social behavior * population dynamics * aggregation and swarming. The topics presented point toward new and challenging frontiers of applied mathematics, making the volume a useful

Due September 2010
2010. 312 p. (CIME Summer Schools, 78)
978-3-642-13928-4 ◄ approx. 34,95 €

Collective Behavior in Socio-Economic and Life Sciences
reference text for applied mathematicians, physicists, biologists, and economists involved in the modeling of socio-economic systems.

More on www.springer.com/978-0-8176-4945-6

Due September 2010

2010. X, 422 p. 98 illus. (Modeling and Simulation in Science, Engineering and Technology.)
978-0-8176-4945-6 ▶ approx. 109,95 €

A. Pascucci

PDE and Martingale Methods in Option Pricing

This book offers an introduction to the mathematical, probabilistic and numerical methods used in the modern theory of option pricing. The text is designed for readers with a basic mathematical background. The first part contains a presentation of the arbitrage theory in discrete time. In the second part, the theories of stochastic calculus and parabolic PDEs are developed in detail and the classical arbitrage theory is analyzed in a Markovian setting by means of PDEs techniques. After the martingale representation theorem and the Girsanov theory have been presented, arbitrage pricing is revisited in the martingale theory optics. General tools from PDE and martingale theories are also used in the analysis of volatility modeling. The book also contains an Introduction to Lévy processes and Malliavin calculus. The last part is devoted to the description of the numerical methods used in option pricing: Monte Carlo, binomial trees, finite differences and Fourier transform.

More on www.springer.com/978-0-8176-4945-6

Due September 2010

2010. XV, 650 p. 20 illus. (Bocconi & Springer Series,)
978-0-8176-4945-6 ▶ approx. 109,95 €

G. Peccati, M.S. Taqqu

Wiener Chaos: Moments, Cumulants and Diagrams

A survey with Computer Implementation

The concept of Wiener chaos generalizes to an infinite-dimensional setting the properties of orthogonal polynomials associated with probability distributions on the real line. It plays a crucial role in modern probability theory, with applications ranging from Malliavin calculus to stochastic differential equations and from probabilistic approximations to mathematical finance. This book is concerned with combinatorial structures arising from the study of chaotic random variables related to infinitely divisible random measures. The combinatorial structures involved are those of partitions of finite sets, over which Möbius functions and related inversion formulae are defined. This combinatorial standpoint (which is originally due to Rota and Wallstrom) provides an ideal framework for diagrams, which are graphical devices used to compute moments and cumulants of random variables. Several applications are described, in particular, recent limit theorems for chaotic random variables. An Appendix presents a computer implementation in MATHEMATICA for many of the formulæ.

More on www.springer.com/978-88-470-1780-1

Due August 2010

2010. X, 238 p. 10 illus., 5 in color.
978-88-470-1780-1 ▶ approx. 99,95 €

S. Pickl, W. Krabs

Dynamical Systems

Stability, Controllability and Chaotic Behavior

At the end of the nineteenth century Lyapunov and Poincaré developed the so-called qualitative theory of differential equations and introduced geometric-topological considerations which have led to the concept of dynamical systems. In its present abstract form this concept goes back to G.D. Birkhoff. This is also the starting point of Chapter 1 of this book in which uncontrolled and controlled time-continuous and time-discrete systems are investigated. Controlled dynamical systems could be considered as dynamical systems in the strong sense, if the controls were incorporated into the state space. We, however, adapt the conventional treatment of controlled systems as in control theory. We are mainly interested in the question of controllability of dynamical systems into equilibrium states. In the non-autonomous time-discrete case we also consider the problem of stabilization. We conclude with chaotic behavior of autonomous time discrete systems and actual real-world applications.

More on www.springer.com/978-3-642-13721-1

Due August 2010

2010. X, 206 p. 11 illus., 7 in color.
978-3-642-13721-1 ▶ approx. 49,95 €

E. Platen, N. Bruti-Liberati

Numerical Solution of Stochastic Differential Equations with Jumps in Finance

In financial and actuarial modeling and other areas of application, stochastic differential equations with jumps have been employed to describe the dynamics of various state variables. The numerical solution of such equations is more complex than that of those only driven by Wiener processes, described in Kloeden & Platen: Numerical Solution of Stochastic Differential Equations (1992). The present monograph builds on the above-mentioned work and provides an introduction to stochastic differential equations with jumps, in both theory and application, emphasizing the numerical methods needed to solve such equations. It presents many new results on higher-order methods for scenario and Monte Carlo simulation, including implicit, predictor corrector, extrapolation, Markov chain and variance reduction methods, stressing the importance of their numerical stability. Furthermore, it includes chapters on exact simulation, estimation and filtering. Besides serving as a basic text on quantitative methods, it offers ready access to a large number of potential research problems in an area that is widely applicable and rapidly expanding. Finance is chosen as the area of application because much of the recent research on stochastic numerical methods has been driven by challenges in quantitative finance. Moreover, the volume introduces readers to the modern benchmark approach that provides a general framework for modeling in finance and insurance beyond the standard risk-neutral approach. It requires undergraduate background in mathematical or quantitative methods, is accessible to a broad readership, including those who are only seeking numerical recipes, and includes exercises that help the reader...
develop a deeper understanding of the underlying mathematics.

More on www.springer.com/978-3-642-12057-2

Due August 2010

2010. XXVI, 856 p. (Stochastic Modelling and Applied Probability, 64)
978-3-642-12057-2 ▶ 69,95 €

Forthcoming

C. Pötzsche

Geometric Theory of Discrete Nonautonomous Dynamical Systems

Nonautonomous dynamical systems provide a mathematical framework for temporally changing phenomena, where the law of evolution varies in time due to seasonal, modulation, controlling or even random effects. Our goal is to provide an approach to the corresponding geometric theory of nonautonomous discrete dynamical systems in infinite-dimensional spaces by virtue of 2-parameter semigroups (processes). These dynamical systems are generated by implicit difference equations, which explicitly depend on time. Compactness and dissipativity conditions are provided for such problems in order to have attractors using the natural concept of pullback convergence. Concerning a necessary linear theory, our hyperbolicity concept is based on exponential dichotomies and splittings. This concept is in turn used to construct nonautonomous invariant manifolds, so-called fiber bundles, and deduce linearization theorems. The results are illustrated using temporal and full discretizations of evolutionary differential equations.

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Due September 2010

978-3-642-14257-4 ▶ 69,95 €

L. Qi, D. Sun, M. Ulbrich

Semismooth and Smoothing Newton Methods

Since its introduction by Isaac Newton (1669) and Joseph Raphson (1690) more than three hundred years ago, Newton’s method or the Newton-Raphson method has become the most important technique for solving the system of smooth algebraic equations. Despite its simple structure, Newton’s method possesses a fast local convergence rate - superlinear or quadratic. This outstanding feature of Newton’s method leads to numerous extensions in the literature. Most of these extensions focus on systems of smooth equations. Since the 1980s, researchers the fields of optimization and numerical analysis have been working on extending Newton’s method to non-differentiable system of algebraic equations. This book presents a comprehensive treatment of the development of the generalized Newton method for solving nonsmooth equations and related problems which grow out of science, engineering, economics and business and sheds light on further investigations of this fascinating topic oriented towards applications in optimization. Semismooth analysis, which form the backbone of further developments, is developed in Chapter 1. Topics then unfold systematically, with appropriate illustrations and examples. Graduate students and researchers in this area will find the book useful.

More on www.springer.com/978-0-387-79149-4

Due December 2010

978-0-387-79149-4 ▶ approx. 61,60 €

N.A. Iliadis, S. Rebennack, M.V. Pereira, P.M. Pardalos

Handbook of Power Systems II

Energy is one of the world’s most challenging problems, and power systems are an important aspect of energy related issues. This handbook contains state-of-the-art contributions on power systems modeling and optimization. The book is separated into two volumes with six sections, which cover the most important areas of energy systems. The first volume covers the topics operations planning and expansion planning while the second volume focuses on transmission and distribution modeling, forecasting in energy, energy auctions and markets, as well as risk management. The contributions are authored by recognized specialists in their fields and consist in either state-of-the-art reviews or examinations of state-of-the-art developments. The articles are not purely theoretical, but instead also discuss specific applications in power systems.

More on www.springer.com/978-0-387-79149-4

Due July 2010

2010. XII, 348 p. 78 illus., 39 in color. (Modeling and Simulation in Science, Engineering and Technology, )
978-0-387-48695-5 ▶ approx. 89,95 €

R. Ronfard, G. Taubin

Image and Geometry Processing for 3-D Cinematography

The book presents an overview of 3-D cinematography, the science and technology of generating 3-D models of dynamic scenes from multiple cameras at video frame rates. The book covers recent developments in computer vision and computer graphics that have made 3-D cinematography possible, and reviews the challenges and open issues that need to be addressed in future work. Important applications areas are presented, including production of stereoscopic movies, full 3-D animation from multiple videos, special effects for more traditional movies, and broadcasting of multiple-viewpoint television. The book brings together researchers and practitioners of macroscopic phenomena in real-world problems. Building on the fundamentals presented in the authors’ previous book, Continuum Mechanics using Mathematica®, this new work explores interesting models of continuum mechanics, with an emphasis on exploring the flexibility of their applications in a wide variety of fields. Specific topics, which have been chosen to show the power of continuum mechanics to characterize the experimental behavior of real phenomena, include: various aspects of nonlinear elasticity, including equilibrium equations and their variational formulation, nonlinear constitutive equations, existence and uniqueness theorems of Van Buren and Stoppelli, and Signorini’s method with some extensions to live loads and acceleration waves. A model of a continuum with a nonmaterial moving interface is also discussed: The Gibbs Rule in a binary mixture with Bénard convection and in a variational formulation with some extensions to live loads and acceleration waves.
from computer graphics, computer vision, broadcasting and motion pictures, to offer a broad perspective on all current areas of research related to the production of high quality 3-D models of live-action scenes.

More on www.springer.com/978-3-642-12391-7

Due July 2010

2010. 298 p. 94 illus., 47 in color. (Geometry and Computing, 5)
978-3-642-12391-7 ► 89,95 €

V. Rovenski

Modeling of Curves and Surfaces with MATLAB®

This text on geometry is devoted to various central geometrical topics including: graphs of functions, transformations, (non-)Euclidean geometries, curves and surfaces as well as their applications in a variety of disciplines. This book presents elementary methods for analytical modeling and demonstrates the potential for symbolic computational tools to support the development of analytical solutions. The author systematically examines several powerful tools of MATLAB® including 2D and 3D animation of geometric images with shadows and colors, transformations using matrices, and then studies more complex geometrical modeling problems related to analysis of curves and surfaces. With over 150 stimulating exercises and problems, this text integrates traditional differential and non-Euclidean geometries with more current computer systems in a practical and user-friendly format. This text greatly extends the author’s previous title, Geometry of Curves and Surfaces with Maple (Birkhäuser, © 2000), and has a different focus. In addition to being applications driven and motivated by numerous examples and exercises from real-world fields, the book also contains over 60 percent new material, including new sections with complex numbers, quaternions, matrices and transformations, hyperbolic geometry, fractals, and surface-splines and over 300 figures reproducible using MATLAB® programs. This text is an excellent classroom resource or self-study reference for undergraduate students in a variety of disciplines, engineers, computer scientists, and instructors of applied mathematics.


Available

2010. XII, 452 p. 156 illus. (Springer Undergraduate Texts in Mathematics and Technology, 7)
978-0-387-71277-2 ► 59,95 €

M. Sabin

Analysis and Design of Univariate Subdivision Schemes

This book covers the theory of subdivision curves in detail, which is a prerequisite for that of subdivision surfaces. The book reports on the currently known ways of analysing a subdivision scheme (i.e. measuring criteria which might be important for the application of a scheme to a given context). It then goes on to consider how those analyses can be used in reverse to design a scheme best matching the particular criteria for a given application. The book is presented in an accessible fashion, even for those whose mathematics is a tool to be used, not a way of life. It should provide the reader with a full and deep understanding of the state-of-the-art in subdivision analysis, and separate sections on mathematical techniques provide revision for those needing it. The book will be of great interest to those starting to do research in CAD/CAE. It will also appeal to those lecturing in this subject and industrial workers implementing these methods. The author has spent his professional life on the numerical representation of shape and his book fills a need for a book covering the fundamental ideas in the simplest possible context, that of curves.

More on www.springer.com/978-3-642-13464-7

Due September 2010

2010. 200 p. 100 illus., 50 in color. (Geometry and Computing, 6)
978-3-642-13464-7 ► 49,95 €

P. Salmon

Categories and Commutative Algebra

Lectures given at the Centro Internazionale Matematico Estivo (C.I.M.E.) held in Varenna (Como), Italy, September 11-21,1971


More on www.springer.com/978-3-642-10978-2

Due October 2010

2011. 338 p. (CIME Summer Schools, 58)
978-3-642-10978-2 ► approx. 34,95 €


Holomorphic Dynamical Systems

Cetraro, Italy, July 7-12, 2008

The theory of holomorphic dynamical systems is a subject of increasing interest in mathematics, both for its challenging problems and for its connections with other branches of pure and applied mathematics. This volume collects the Lectures held at the 2008 CIME session on "Holomorphic Dynamical Systems" held in Cetraro, Italy. This CIME Course focused on a number of important topics in the study of discrete and continuous dynamical systems, including both local and global aspects, providing a fascinating introduction to many key problems in current research. The contributions provide an ample description of the phenomena occurring in central themes of holomorphic dynamics such as automorphisms and meromorphic self-maps of projective spaces, of entire maps on complex spaces and holomorphic foliations in surfaces and higher dimensional manifolds, elaborating on the different techniques used and familiarizing readers with the latest findings on current research topics.

More on www.springer.com/978-3-642-13170-7

Due August 2010

2010. XII, 348 p. (Lecture Notes in Mathematics, 1999)
978-3-642-13170-7 ► approx. 44,95 €

H. Schoutens

The Use of Ultraproducts in Commutative Algebra

In spite of some recent applications of ultraproducts in algebra, they remain largely unknown to commutative algebraists, in part because they do not preserve basic properties such as Noetherianity. This work wants to make a strong case against these prejudices. More precisely, it studies ultraproducts of Noetherian local rings from a purely algebraic perspective, as well as how they can be used to transfer results between the positive and zero characteristics, to derive uniform bounds, to define tight closure in characteristic zero, and to prove asymptotic versions of homological conjectures in mixed characteristic. Some of these results are obtained using variants called chromatic products, which are often even Noetherian. This book, neither assuming nor using any logical formalism, is intended for algebraists and geometers, in the hope of popularizing ultraproducts and their applications in algebra.

More on www.springer.com/978-3-642-13367-1

Due August 2010

978-3-642-13367-1 ► approx. 44,95 €

Forthcoming

H. Schoutens
Ramsey Theory: Yesterday, Today, and Tomorrow

Ramsey theory is a relatively "new," approximately 100-year-old direction of fascinating mathematical thought that touches on many classic fields of mathematics such as combinatorics, number theory, geometry, ergodic theory, topology, combinatorial geometry, set theory, and measure theory. Ramsey theory possesses its own unifying ideas, and some of its results are among the most beautiful theorems of mathematics. The underlying theme of Ramsey theory can be formulated as: any finite coloring of a large enough system contains a monochromatic subsystem of higher degree of organization than the system itself, or as T.S. Motzkin famously put it, absolute disorder is impossible. Ramsey Theory: Yesterday, Today, and Tomorrow explores the theory's history, recent developments, and some promising future directions through invited surveys written by prominent researchers in the field. The first three surveys provide historical background on the subject; the last three address Euclidean Ramsey theory and related coloring problems. In addition, open problems posed throughout the volume and in the concluding open problem chapter will appeal to graduate students and mathematicians alike. Contributors: J. Burkert A. Dudek R.L. Graham A. Gyárfás P.D. Johnson, Jr. S.P. Radziszowski V. Rödl J.H. Spencer A. Soifer E. Tressler

More on www.springer.com/978-0-8176-8091-6

Ramsey Theory

A. Soifer

Selecta: Volume II

Probability Theory, Statistical Mechanics, Mathematical Physics and Mathematical Fluid Dynamics

The 20 papers contained in this volume span the areas of mathematical physics, dynamical systems, and probability. Yakov Sinai is one of the most important and influential mathematicians of our time, having won the Boltzmann Medal (1986), the Dirac Medal (1992), Dannie Heinemann Prize for Mathematical Physics (1989), Nemmers Prize (2002), and the Wolf Prize in Mathematics (1997). He is well-known as both a mathematician and a physicist, with numerous theorems and proofs bearing his name in both fields, and this book should be of interest to researchers from all fields of the physical sciences. This volume follows Volume I.

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Spinors in Four-Dimensional Spaces

G. Tomassini

Algebraic Surfaces

Lectures given at the Centro Internazionale Matematico Estivo (C.I.M.E.) held in Cortona (Arezzo), Italy, June 22-30, 1977


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Due October 2010

2011. 300 p. (CIME Summer Schools, 76)

978-3-642-11086-3 ▶ approx. 34,95 €

Spinors in Four-Dimensional Spaces

G.F. Torres del Castillo

Without using the customary Clifford algebras frequently studied in connection with the representations of orthogonal groups, this book gives an elementary introduction to the two-component spinor formalism for four-dimensional spaces with any signature. Some of the useful applications of four-dimensional spinors, such as Yang–Mills theory, are derived in detail using illustrative examples. Key topics and features: • Uniform treatment of the spinor formalism for four-dimensional spaces with any signature, not only the usual signature (+ + + #) employed in relativity • Examples taken from Riemannian geometry and special or general relativity are discussed in detail, emphasizing the usefulness of the two-component spinor formalism • Exercises in each chapter • The relationship of Clifford algebras and Dirac four-component spinors is established • Applications of the two-component formalism, focusing mainly on general relativity, are presented in the context of actual computations: Spinors in Four-Dimensional Spaces is aimed at graduate students and researchers in mathematical and theoretical physics interested in the applications of the two-component spinor formalism in any four-dimensional vector space or Riemannian manifold with...
a definite or indefinite metric tensor. This systematic and self-contained book is suitable as a seminar text, a reference book, and a self-study guide. Reviews from the author’s previous book, 3-D Spinors, Spin-Weighted Functions and their Applications: In summary...the book gathers much of what can be done with 3-D spinors in an easy-to-read, self-contained form designed for applications that will supplement many available spinor treatments. The book...should be appealing to graduate students and researchers in relativistic and mathematical physics. — Mathematical Reviews

The present book provides an easy-to-read and unconventional presentation of the spinor formalism for three-dimensional spaces with a definite or indefinite metric...Following a nice and descriptive introduction...the final chapter contains some applications of the formalism to general relativity. — Monatshefte für Mathematik

More on www.springer.com/978-0-8176-4983-8
Due August 2010
2010. VIII, 176 p. (Progress in Mathematical Physics, 59) 978-0-8176-4983-8 ► approx. 73,40 €

**Hilbert Functions of Filtered Modules**

Hilbert functions play major parts in Algebraic Geometry and Commutative Algebra, and are also becoming increasingly important in Computational Algebra. They capture many useful numerical characters associated to a projective variety or to a filtered module over a local ring. Starting from the pioneering work of D.G. Northcott and J. Sally, we aim to gather together in one book a broad range of new developments in this theory by using a unifying approach which yields self-contained and easier proofs. The extension of the theory to the case of general filtrations on a module, and its application to the study of certain graded algebras which are not associated to a filtration are two of the main features of this work. The material is intended for graduate students and researchers who are interested in Commutative Algebra, particularly in the theory of the Hilbert functions and related topics.

More on www.springer.com/978-3-642-11101-3
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2011. 160 p. (CIME Summer Schools, 73) 978-3-642-11101-3 ► approx. 19,95 €

**Differential Topology**

Lectures given at the Centro Internazionale Matematico Estivo (C.I.M.E.) held in Varenna (Como), Italy, August 27-September 4, 1976


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2011. 160 p. (CIME Summer Schools, 73) 978-3-642-11101-3 ► approx. 19,95 €

**Elliptic Partial Differential Equations**

Volume 1: Fredholm Theory of Elliptic Problems in Unbounded Domains

The theory of elliptic partial differential equations has developed during about two centuries together with electrostatics, heat and mass diffusion, hydrodynamics and many other applications. It remains one of the most rapidly developing fields of mathematics. The theory of general elliptic problems is presented in the present first volume of the book. A priori estimates, normal solvability and Fredholm property, index, operators with a parameter, nonlinear Fredholm operators are discussed. Particular attention is paid to elliptic problems in unbounded domains which are not yet sufficiently well presented in the existing literature and which require some special approaches. The second volume will be devoted to reaction-diffusion equations. Existence and bifurcations of solutions, travelling waves, spectral properties and other questions are studied in relation with numerous applications in chemical physics, biology and medicine.

More on www.springer.com/978-3-0346-0536-6
Due November 2010
2010. 600 p. (Monographs in Mathematics, 200) 978-3-0346-0536-6 ► approx. 99,00 €

**The Hill–Brown Theory of the Moon’s Motion**

Its Coming-to-be and Short-lived Ascendancy (1877–1984)

The Hill–Brown theory of lunar motion was, from its completion in 1908 to its retirement in 1984, the most accurate model of the moon’s orbit. The mathematical, philosophical, and historical interest in the analytic solution of the lunar problem using the Hill–Brown method still engages celestial mechanicians,
and is the primary focus of this work. This book, in three parts, describes three phases in the development of the modern theory and calculation of the Moon’s motion. Part I explains the crisis in lunar theory in the 1870s that led G.W. Hill to lay a new foundation for an analytic solution, a preliminary orbit he called the “variational curve.” Part II is devoted to E.W. Brown’s completion of the new theory as a series of successive perturbations of Hill’s variational curve. Part III describes the revolutionary developments in time-measurement and the determination of Earth-Moon and Earth-planet distances that led to the replacement of the Hill–Brown theory in 1984. Although some calculus and differential equations are included, the text is largely accessible without advanced knowledge in these areas. Amateurs of astronomy, as well as instructors and scholars of the general history of science, will find this book of significant interest.


Evolution Inclusions and Variation Inequalities for Earth Data Processing I

Operator Inclusions and Variation Inequalities for Earth Data Processing

Here, the authors present modern mathematical methods to solve problems of differential-operator inclusions and evolution variation inequalities which may occur in fields such as geophysics, aero-hydrodynamics, or fluid dynamics. For the first time, they describe the detailed generalization of various approaches to the analysis of fundamentally nonlinear models and provide a toolbox of mathematical equations. These new mathematical methods can be applied to a broad spectrum of problems. Examples of these are phase changes, diffusion of electromagnetic, acoustic, vibro-, hydro- and seismoacoustic waves, or quantum mechanical effects. This is the first of two volumes dealing with the subject.

More on www.springer.com/978-1-4419-1635-8

Due July 2010

2010. XIII, 267 p. 120 illus., 60 in color. (Springer Optimization and Its Applications, 41)
978-1-4419-1635-8 ► approx. 89,95 €

Evolution Inclusions and Variation Inequalities for Earth Data Processing II

Differential-Operator Inclusions and Evolution Variation Inequalities for Earth Data Processing

Here, the authors present modern mathematical methods to solve problems of differential-operator inclusions and evolution variation inequalities which may occur in fields such as geophysics, aero-hydrodynamics, or fluid dynamics. For the first time, they describe the detailed generalization of various approaches to the analysis of fundamentally nonlinear models and provide a toolbox of mathematical equations. These new mathematical methods can be applied to a broad spectrum of problems. Examples of these are phase changes, diffusion of electromagnetic, acoustic, vibro-, hydro- and seismoacoustic waves, or quantum mechanical effects. This is the second of two volumes dealing with the subject.

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Complex Intelligent Systems and Their Applications

“Complex Intelligent Systems and Their Applications” presents the most up-to-date advances in complex, software intensive and intelligent systems. Each self-contained chapter is the contribution of distinguished experts in areas of research relevant to the study of complex, intelligent and software intensive systems. These contributions focus on the resolution of complex problems from areas of networking, optimization and artificial intelligence. This book is divided into three parts focusing on complex intelligent network systems, efficient resource management in complex systems, and artificial data mining systems.

Through the presentation of these diverse areas of application, the volume provides insights into the multidisciplinary nature of complex problems. Throughout the entire book, special emphasis is placed on optimization and efficiency in resource management, network interaction, and intelligent system design. Key Features of “Complex Intelligent Systems and Their Applications” include: - Consider the multi-disciplinary nature of complex problems in intelligent systems and a range of state-of-the-art techniques used to resolve these problems. - Graduate students as well as researchers will find this a useful guide to the most up-to-date techniques available to resolve complex problems in networking, optimization, and artificial intelligence. - Real life examples presented throughout the book extend the text’s suit-
Regression models with long range dependent errors changes in the variance of random processes. Linear models are used for studying multifractal processes with fractal properties are analysed. Wavelets-based methods are introduced, and their multifractal properties are studied, as well as the issue of detection of changes in their parameters.

More on www.springer.com/978-3-642-14103-4

Due July 2010

2010. XV, 205 p. (Lecture Notes in Statistics, 200)
978-3-642-14103-4 ▶ approx. 59,95 €

R.W. Keener

Statistical Theory
A Course in Theoretical Statistics

Intended as the text for a sequence of advanced courses, this book covers major topics in theoretical statistics in a concise and rigorous fashion. The discussion assumes a background in advanced calculus, linear algebra, probability, and some analysis and topology. Measure theory is used, but the notation and basic results needed are presented in an initial chapter on probability, so prior knowledge of these topics is not essential. The presentation is designed to expose students to as many of the central ideas and topics in the discipline as possible, balancing various approaches to inference as well as exact, numerical, and large sample methods. Moving beyond more standard material, the book includes chapters introducing bootstrap methods, nonparametric regression, equivariant estimation, empirical Bayes, and sequential design and analysis. The book has a rich collection of exercises. Several of them illustrate how the theory developed in the book may be used in various applications. Solutions to many of the exercises are included in an appendix. Robert Keener is Professor of Statistics at the University of Michigan and a fellow of the Institute of Mathematical Statistics.


Due September 2010

978-0-387-93838-7 ▶ approx. 62,95 €

M. Lovric

International Encyclopedia of Statistical Science

The goal of this book is multidimensional: a) to help reviving Statistics education in many parts in the world where it is in crisis. For the first time authors from many developing countries have an opportunity to write together with the most prominent world authorities. The editor has spent several years searching for the most reputable statisticians all over the world. International contributors are either presidents of the local statistical societies, or head of the Statistics department at the main university, or the most distinguished statisticians in their countries. b) to enable any non-statistician to obtain quick and yet comprehensive and highly understandable view on certain statistical term, method or application c) to enable all the researchers, managers and practitioners to refresh their knowledge in Statistics, especially in certain controversial fields. d) to revive interest in statis-
tics among students, since they will see its usefulness and relevance in almost all branches of Science.

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Forthcoming

P. Mantovan, P. Secchi

Complex Data Modeling and Computationally Intensive Statistical Methods

The last years have seen the advent and development of many devices able to record and store an always increasing amount of complex and high dimensional data; 3D images generated by medical scanners or satellite remote sensing, DNA microarrays, real time financial data, system control datasets, ... The analysis of this data poses new challenging problems and requires the development of novel statistical models and computational methods, fueling many fascinating and fast growing research areas of modern statistics. The book offers a wide variety of statistical methods and is addressed to statisticians working at the forefront of statistical analysis.

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