

New Series with Birkhäuser

Studies in Universal Logic

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BIRKH AUSER

This series is devoted to the universal approach to logic and the development of a general theory of logics. It covers topics such as global set-ups for fundamental theorems of logic and frameworks for the study of logics, in particular logical matrices, Kripke structures, combination of logics, categorical logic, abstract proof theory, consequence operators, and algebraic logic. It includes also books with historical and philosophical discussions about the nature and scope of logic.

Three types of books will appear in the series: graduate textbooks, research monographs, and volumes with contributed papers.

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Coming soon

Pogorzelski, W.A. / Wojtylak, P.

Completeness Theory for Propositional Logics

2008. Approx. 180 p. Softcover
  (D) 53.39 /   (A) 54.89 / CHF 85.00
ISBN 978-3-7643-8517-0

Due in December 2007

Andr eka, H. / N emeti, I. / Sain, I.

Universal Algebraic Logic

Dedicated to the Unity of Science
2008. Approx. 260 p. Softcover
  (D) 64.10 /   (A) 65.89 / CHF 105.00
ISBN 978-3-7643-8505-7

Due in January 2008

H. Andr eka, I. N emeti, I. Sain, Hungarian Academy of Sciences, Budapest, Hungary

Universal Algebraic Logic

Dedicated to the Unity of Science

The three main themes of this book are (i) universal logic and the question of what logic is, (ii) universal algebraic logic and duality theories between the world of logics and the world of algebra, and (iii) 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 algebraizations of logics, category theoretical perspectives are also touched upon. 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 part of the perspective of the book. An introductory chapter contains the necessary algebraic basics, this can be used in its own right as a quick introduction to universal algebra.

Features

► Introduction to algebraic basics ► Connects logic with algebra

Contents

1. Introduction.- 2. Notation, elementary concepts.- 3. Basics from universal algebra.- 4. General framework for studying logics.- 5. Bridge between the world of logics and the world of algebras.- 6. Generalizations.- 7. Further equivalence results (definability, interpolation, omitting types).- 8. New kinds of logics 9. The guarded fragment and its finite variable hierarchy.- 10. Distinguished algebras of logic.- 11. Applications of the algebraic results to logic (via our bridge).- 12. Connections with set theory and foundational thinking.- 13. Connections with abstract model theory.

Fields of interest

Mathematical Logic and Foundations; Algebra

Target groups

Graduates, postgraduates, and researchers; computer scientists, mathematicians, philosophers, linguists

Type of publication

Monograph

M. di Bernardo, C. Budd, A. Champneys, P. Kowalczyk

Piecewise-smooth Dynamical Systems

Theory and Applications

The primary purpose of this book is to introduce a coherent framework for understanding the dynamics of piecewise-smooth and hybrid systems. An informal introduction asserts the ubiquity of such models with examples drawn from mechanics, electronics, control theory and physiology. The main thrust is to classify complex behaviour via bifurcation theory in a systematic yet applicable way. The key concept is that of discontinuity-induced bifurcation, which generalises diverse phenomena such as grazing, border-collision, sliding, chattering and the period-adding route to chaos. The results are presented in an informal style and illustrated with copious examples, both theoretical and experimental. Aimed at a wide audience of applied mathematicians, engineers and scientists at the early post-graduate level, the book assumes only the standard background of basic calculus and algebra and will be an indispensable resource for students and researchers.

Features

► A comprehensive 'tool-kit' that provides a complete reference to bifurcation theory for piecewise-smooth dynamical systems ► Informal introduction serves as a primer for the non-specialist and introduces all the main ideas with real-world examples ► Inclusion of a comprehensive bibliography and many open questions will serve as a stimulus for future research

Fields of interest

Dynamical Systems and Ergodic Theory; Applications of Mathematics; Control Engineering

Target groups

Postgraduate students and researchers in mathematics, engineering, and the applied sciences

Type of publication

Monograph

M. Berti, Universit  di Napoli, Italia

Nonlinear Oscillations of Hamiltonian PDEs

Many partial differential equations (PDEs) that arise in physics can be viewed as infinite-dimensional Hamiltonian systems. This monograph presents recent existence results of nonlinear oscillations of Hamiltonian PDEs, particularly of periodic solutions for completely resonant nonlinear wave equations.

After introducing the reader to classical finite-dimensional dynamical system theory, including the Weinstein – Moser and Fadell – Rabinowitz bifurcation results, the analogous theory for nonlinear wave equations is developed. The theory and applications of the Nash – Moser theorem to a class of nonlinear wave equations is also discussed together with other basic notions of Hamiltonian PDEs and number theory. The main examples of Hamiltonian PDEs presented include: the nonlinear wave equation, the nonlinear Schr dinger equation, beam equations, and the Euler equations of hydrodynamics.

Features

► Introductory treatise to the current research in the field ► Includes an appendix that discusses the basic notions of Hamiltonian PDEs and number theory

Contents

Introduction.- Finite dimension.- Infinite dimension.- A tutorial in Nash – Moser theory.- Application to the NLW.- Forced vibrations.- Appendix.- Index.

Fields of interest

Partial Differential Equations; Dynamical Systems and Ergodic Theory; Approximations and Expansions

Target groups

Graduate students and researchers interested in variational techniques and nonlinear analysis applied to Hamiltonian PDEs

Type of publication

Monograph

BIRKH USER

Due January 2008

2008. Approx. 260 p. (Studies in Universal Logic) Softcover

► * € (D) 64,09 | € (A) 65,89 | sFr 105,00
ISBN 978-3-7643-8505-7



9 783764 385057



Due October 2007

2007. Approx. 504 p. 234 illus. (Applied Mathematical Sciences, Volume 163) Hardcover

► * € (D) 82,34 | € (A) 84,65 | sFr 126,50
ISBN 978-1-84628-039-9



9 781846 280399

BIRKH USER

Due November 2007

2008. Approx. 180 p. 10 illus. (Progress in Nonlinear Differential Equations and Their Applications, Volume 74) Hardcover

► approx. * € (D) 64,09 | € (A) 65,89 | sFr 98,00
ISBN 978-0-8176-4680-6



9 780817 646806



R. Carmona, E. Cinlar, I. Ekeland, E. Jouini,
J. Scheinkman, N. Touzi (Eds)

Paris-Princeton Lectures on Mathematical Finance 2004

The Paris-Princeton Lectures in Financial Mathematics, of which this is the third volume, published on an annual basis, cutting-edge research in self-contained, expository articles from outstanding - established or upcoming! - specialists. The aim is to produce a series of articles that can serve as an introductory reference for research in the field. It arises as a result of frequent exchanges between the finance and financial mathematics groups in Paris and Princeton. The present volume comprises articles by René Carmona, Ivar Ekeland/Erik Taflin, Arturo Kohatsu-Higa, Pierre-Louis Lions/Jean-Michel Lasry, and Huy  n Pham.

Contents

R. Carmona: HJM: A Unified Approach to Dynamic Models for Fixed Income, Credit and Equity Markets.- I. Ekeland, Erik Taflin: Optimal Bond Portfolios.- A. Kohatsu-Higa: Models for Insider Trading with Finite Utility.- P.-L. Lions, J.-M. Lasry: Large Investor Trading Impacts on Volatility.- H. Pham: Some Applications and Methods of Large Deviations in Finance and Insurance.

Fields of interest

Quantitative Finance; Game Theory, Economics, Social and Behav. Sciences; Probability Theory and Stochastic Processes

Target groups

Researchers and graduate students of quantitative finance

Type of publication

Monograph

A. M. Cohen, Cardiff University, UK

Numerical Methods for Laplace Transform Inversion

Operational methods have been used for over a century to solve problems such as ordinary and partial differential equations. When solving such problems, in many cases it is fairly easy to obtain the Laplace transform, while it is very demanding to determine the inverse Laplace transform that is the solution of a given problem. Sometimes, after some difficult contour integration, we may find that a series solution results, but this may be quite difficult to evaluate in order to get an answer at a particular time value.

The advent of computers has given an impetus to developing numerical methods for the determination of the inverse Laplace transform. This book gives background material on the theory of Laplace transforms, together with a fairly comprehensive list of methods that are available at the current time. Computer programs are included for those methods that perform consistently well on a wide range of Laplace transforms.

Features

► Presents state-of-the-art research on numerical methods for evaluating the inverse Laplace transform

Contents

Preface.- Acknowledgments.- Notation.- Basic Results.- Inversion Formulae and Practical Results.- The Method of Series Expansion.- Quadrature Methods.- Rational Approximation Methods.- The Method of Talbot.- Methods Based on the Post-Widder Inversion Formula.- The Method of Regularization.- Survey Results.- Applications.- Appendix.- Index.

Fields of interest

Integral Transforms, Operational Calculus; Appl. Mathematics/Computational Methods of Engineering

Target groups

Engineers, scientists, mathematicians, statisticians, and financial planners

Type of publication

Monograph

I. Cardinali, Universit   di Siena, Italia; S. E. Payne,
University of Colorado, Denver, CO, USA

q-Clan Geometries in Characteristic 2

A q-clan with q a power of 2 is equivalent to a certain generalized quadrangle with a family of subquadrangles each associated with an oval in the Desarguesian plane of order 2. It is also equivalent to a flock of a quadratic cone, and hence to a line-spread of 3-dimensional projective space and thus to a translation plane, and more. These geometric objects are tied together by the so-called Fundamental Theorem of q-Clan Geometry. We give a complete proof of this theorem, followed by a detailed study of the known examples. The collineation groups of the associated generalized quadrangles and the stabilizers of their associated ovals are worked out completely.

Features

► Offers the only comprehensive, coherent treatment of the theory (in characteristic 2) of the so-called flock quadrangles, those generalized quadrangles (GQ) that arise from q-clans, along with their associated ovals ► Gives a concise but logically complete introduction to the basic ideas, but otherwise has only trivial intersection with any other book-length treatment of GQ

Contents

Introduction.- 1. q-Clans and Their Geometries.- 2. The Fundamental Theorem.- 3. Aut(GQ(C)).- 4. The Cyclic q-Clans.- 5. Applications to the Known Cyclis q-Clans.- 6. The Subiaco Oval Stabilizers.- 7. The Adelaide Oval Stabilizers.- 8. The Payne q-Clans.- 9. Other Good Stuff.- Bibliography.

Fields of interest

Convex and Discrete Geometry

Target groups

Graduates and researchers in (finite)geometry

Type of publication

Monograph

Due August 2007

2007. VIII, 213 p. (Lecture Notes in Mathematics, Volume 1919) Softcover

► * € (D) 42,75 | € (A) 43,95 | sFr 65,50
ISBN 978-3-540-73326-3



9 783540 733263

Due July 2007

2007. XIV, 252 p. (Numerical Methods and Algorithms, Volume 5) Hardcover

► * € (D) 58,80 | € (A) 60,45 | sFr 90,50
ISBN 978-0-387-28261-9



9 780387 282619



BIRKHAUSER

Due August 2007

2007. Approx. 200 p. (Frontiers in Mathematics) Softcover

► * € (D) 42,69 | € (A) 43,89 | sFr 69,90
ISBN 978-3-7643-8507-1



9 783764 385071



D. Daley, Australian National University, Canberra, ACT, Australia; D. Vere-Jones, Victoria University, Wellington, New Zealand

An Introduction to the Theory of Point Processes, Volume II

Point processes and random measures find wide applicability in telecommunications, earthquakes, image analysis, spatial point patterns and stereology, to name but a few areas. The authors have made a major reshaping of their work in their first edition of 1988 and now present their An Introduction to the Theory of Point Processes in two volumes with subtitles Volume I: Elementary Theory and Methods and Volume II: General Theory and Structure. Volume I contains the introductory chapters from the first edition together with an account of basic models, second order theory, and an informal account of prediction, with the aim of making the material accessible to readers primarily interested in models and applications. It also has three appendices that review the mathematical background needed mainly in Volume II.

Features

► Point processes and random measures are widely applied in telecommunications, earthquakes, image analysis, spatial point patterns, and stereology ► Volume One incorporates introductory material from the First Edition with a foretaste of more advanced concepts ► Volume Two builds on general theory with additional material on marked and spatial processes ► Abundant examples both reinforce core understanding and illustrate further applications of the models

Contents

Basic theory of random measures and point processes.- Special classes of processes.- Convergence concepts and limit theorems.- Stationary point processes and random measures.- Palm theory.- Evolutionary processes and predictability.- Spatial point processes.

Fields of interest

Probability Theory and Stochastic Processes

Target groups

Graduate students, researchers

Type of publication

Monograph

Due October 2007

Originally published in one volume in the series: Springer Series in Statistics

2nd ed. 2007. Approx. 560 p. (Probability and its Applications) Hardcover

► approx. * € (D) 74,15 | € (A) 76,23 | sFr 113,50
ISBN 978-0-387-21337-8



9 780387 213378



M. Ericsson, University of Cambridge, UK (Ed.)

Quantum Information and Many Body Quantum Systems

In the last years a growing attention has been dedicated to many body quantum systems from the point of view of quantum information. Indeed, after the initial investigation of simple systems as single or two qubits, the need of understanding the characteristics of a realistic quantum information device leads necessarily to the study of many body quantum systems. These studies are also driven by the very fast development of experiments which in the last years reach the goal of coherent control of a few qubits (ion traps, charge qubits, etc.) with a roadmap for further scaling and improvement of coherent control and manipulation techniques. This book gives a selection of current research topics in the field of quantum information for many body quantum systems together with open problems.

Features

► First book in this area ► New paradigm of performing quantum information tasks, such as quantum information transfer, quantum cloning and others, without direct control of the whole quantum system but using our knowledge of it has increased the need of tools to understand in details the behaviour of many body quantum system as we find them in nature

From the contents

Entanglement percolation in quantum networks.- Classical simulation of strongly correlated systems.- Quantum information and many body theory.- Electronic Hong-Ou-Mandel interferometer for multi-mode entanglement detection.- Energy, entanglement, and information transfer in many body systems.

Fields of interest

Information and Communication, Circuits; Mathematics of Computing; Data Structures, Cryptology and Information Theory

Target groups

Graduate students and researchers that want to get an overview and introduction to current developments in the field

Type of publication

Proceedings

BIRKHAUSER

Due January 2008

2008. Approx. 400 p. (Publications of the Scuola Normale Superiore / CRM Series, Volume 5) Softcover

► * € (D) 26,75 | € (A) 27,50 | sFr 42,00
ISBN 978-88-7642-307-9



9 788876 423079

A. Handwerk, Hamburg, Germany; H. Willems, Amsterdam, The Netherlands

Wolfgang Doeblin

A Mathematician Rediscovered

Wolfgang Doeblin, one of the great probabilists of the 20th century, was already widely known in the 1950s for his fundamental contributions to the theory of Markov chains. His coupling method became a key tool in later developments at the interface of probability and statistical mechanics. But the full measure of his mathematical stature became apparent only in 2000 when the sealed envelope containing his construction of diffusion processes in terms of a time change of Brownian motion was finally opened, 60 years after it was sent to the Academy of Sciences in Paris. The film of Agnes Handwerk and Harrie Willems documents scientific and human aspects of this amazing discovery and throws new light on the startling circumstances of his death at the age of 25. I recommend it in the strongest terms.

Hans Föllmer, Faculty of Mathematics, Humboldt University, Berlin

Features

► Well-done documentary of the famous mathematician Wolfgang Doeblin

System requirements

Für PC. Die vollständigen Systemanforderungen finden Sie unter: springer.com

Fields of interest

History of Mathematics; Probability Theory and Stochastic Processes; Mathematical and Computational Physics

Target groups

Mathematicians, physicists, teachers, historians, students, school students, science-interested laymen

Type of publication

Biography

Due July 2007

2007. DVD-Video PAL. (Springer VideoMATH)

► ** € (D) 47,54 | € (A) 47,94 | sFr 69,00
ISBN 978-3-540-71959-5



9 783540 719595



Also available as DVD-Video NTSC. (Springer VideoMATH)

► ** € (D) 47,54 | € (A) 47,94 | sFr 69,00
ISBN 978-3-540-71960-1



9 783540 719601



I. Kleiner, York University, Toronto, ON, Canada

A History of Abstract Algebra

Prior to the nineteenth century, algebra meant the study of the solution of polynomial equations. By the twentieth century it came to encompass the study of abstract, axiomatic systems such as groups, rings, and fields. This presentation provides an account of the intellectual lineage behind many of the basic concepts, results, and theories of abstract algebra.

The development of abstract algebra was propelled by the need for new tools to address certain classical problems that appeared unsolvable by classical means. A major theme of the approach in this book is to show how abstract algebra has arisen in attempts to solve some of these classical problems, providing a context from which the reader may gain a deeper appreciation of the mathematics involved.

Mathematics instructors, algebraists, and historians of science will find the work a valuable reference. The book may also serve as a supplemental text for courses in abstract algebra or the history of mathematics.

Features

► Excellent reference or supplemental text for a first course in abstract algebra ► Provides historical context from which the reader may gain a deeper appreciation of the subject ► Offers suggestions to instructors on ways of integrating the history of abstract algebra into their teaching ► Each chapter concludes with extensive references to the relevant literature

From the contents

Classical Algebra.- Group Theory.- Ring Theory.- Field Theory.- Linear Algebra.- Emmy Noether and the Advent of Abstract Algebra.- A course in abstract algebra inspired by history.

Fields of interest

History of Mathematics; Algebra; Group Theory and Generalizations

Target groups

Mathematics instructors, undergraduate and graduate mathematics majors, algebraists, researchers, historians of mathematics and science, and mathematicians interested in the history of algebra

Type of publication

Monograph

D. Kozlov, ETH Zurich, Switzerland

Combinatorial Algebraic Topology

Combinatorial algebraic topology is a fascinating and dynamic field at the crossroads of algebraic topology and discrete mathematics. This volume is the first comprehensive treatment of the subject in book form. The first part of the book constitutes a swift walk through the main tools of algebraic topology, including Stiefel-Whitney characteristic classes, which are needed for the later parts. Readers - graduate students and working mathematicians alike - will probably find particularly useful the second part, which contains an in-depth discussion of the major research techniques of combinatorial algebraic topology. Our presentation of standard topics is quite different from that of existing texts. In addition, several new themes, such as spectral sequences, are included.

Contents

Overture.- Part I Concepts of Algebraic Topology.- 2 Various complexes.- 3 Homology groups.- 4 Concepts of Category Theory.- 5 Long exact sequences.- 6 Spectral sequences.- 7 Homotopy type.- 8 Cofibrations.- 9 Connectivity and Hurewicz Theorems.- 10 Homotopy colimits.- 11 Principle-bundles and Steifel-Whitney characteristic classes.- 12 Simplicial Sets.- Part II Topological Combinatorics.- 13 Combinatorial complexes melange.- 14 Acyclic categories.- 15 Discrete Morse theory.- 16 Nonevasiveness and monotone maps.- 17 Shellability.- 18 Combinatorial nerve and fibration tools.- 19 Colimits and quotients.- Part III Complexes of Graph Homomorphisms.- 20 Historical introduction.- 21 Structural theory of morphism complexes.- 22 Applications of Stiefel-Whitney classes to chromatic numbers.- 23 Applications of spectral sequences to Hom-complexes.- 24 Summary and outlook.- References.

Fields of interest

Algebraic Topology; Combinatorics

Target groups

Undergraduate and graduate students in mathematics

Type of publication

Graduate/Advanced undergraduate textbook

G. Kutyniok, Princeton University, NJ, USA

Affine Density in Wavelet Analysis

In wavelet analysis, irregular wavelet frames have recently come to the forefront of current research due to questions concerning the robustness and stability of wavelet algorithms. A major difficulty in the study of these systems is the highly sensitive interplay between geometric properties of a sequence of time-scale indices and frame properties of the associated wavelet systems.

This volume provides the first thorough and comprehensive treatment of irregular wavelet frames by introducing and employing a new notion of affine density as a highly effective tool for examining the geometry of sequences of time-scale indices. Many of the results are new and published for the first time. Topics include: qualitative and quantitative density conditions for existence of irregular wavelet frames, non-existence of irregular co-affine frames, the Nyquist phenomenon for wavelet systems, and approximation properties of irregular wavelet frames.

Contents

1.Introduction.- 2.Wavelet and Gabor Frames.- 3.Weighted Affine Density.- 4.Qualitative Density Conditions.- 5.Quantitative Density Conditions.- 6. Homogeneous Approximation Property.- 7.Weighted Beurling Density and Shift-Invariant Gabor.- References.- Index.

Fields of interest

Fourier Analysis; Information and Communication, Circuits

Target groups

Researchers and graduate students

Type of publication

Monograph

BIRKHAUSER*Due September 2007*

2007. Approx. 176 p. 24 illus. Softcover

► approx. * € (D) 44,94 | € (A) 46,20 | sFr 68,00
ISBN 978-0-8176-4684-4



9 780817 646844

*Due September 2007*

2007. Approx. 407 p. (Algorithms and Computation in Mathematics, Volume 21) Hardcover

► * € (D) 85,55 | € (A) 87,95 | sFr 131,00
ISBN 978-3-540-71961-8



9 783540 719618

*Due July 2007*

2007. XII, 142 p. (Lecture Notes in Mathematics, Volume 1914) Softcover

► * € (D) 32,05 | € (A) 32,95 | sFr 49,50
ISBN 978-3-540-72916-7



9 783540 729167

M. Manaresi, University of Bologna, Italy (Ed.)

Mathematics and Culture in Europe

It is not true that mathematics has never been able to arouse people's interest. At least, this is our feeling as mathematicians when we meet the general public to explain what we are dealing with in our work, what is the usefulness of mathematics and how it becomes possible to catch its harmony and beauty.

Also the cinema changed its attitude on the matter, and some screenplays started to show mathematicians engaged in their work while some recent theatrical pieces have a mathematician as a main character.

These considerations stimulated some of us to organize the review *Mathematics and Theatre*, which offered to a general audience the opportunity to attend performances and, at the same time, to hear something about prime numbers, Galois' theory, or simply about the relationship between science, mathematics and power at Napoleon's times.

System requirements

For PC und Mac. For the complete system requirements see: springer.com

Fields of interest

Applications of Mathematics; Mathematics, general; Popular Science in Mathematics/Natural Science/Technology

Target groups

Students and teachers, both at university and secondary school level; everyone who is involved in educating the young or interested in mathematics

Type of publication

Popular science

Due July 2007

Only available in print

Original Italian edition published by Springer Milano

2007. Approx. 410 p. With DVD. Softcover

► * € (D) 53,45 | € (A) 54,95 | sFr 82,00
ISBN 978-3-540-71963-2



9 783540 719632



A. N. Michel, University of Notre Dame, Notre Dame, IN, USA; L. Hou, St. Cloud State University, Saint Cloud, MN, USA; D. Liu, University of Illinois, Chicago, IL, USA

Stability of Dynamical Systems

Continuous, Discontinuous, and Discrete Systems

In the analysis and synthesis of contemporary systems, engineers and scientists are frequently confronted with increasingly complex models that may simultaneously include components whose states evolve along continuous time and discrete instants; components whose descriptions may exhibit nonlinearities, time lags, transportation delays, and uncertainties in parameters; and components that cannot be described by various classical equations, as in the case of discrete-event systems, logic commands, and Petri nets. The qualitative analysis of such systems requires results for finite-dimensional and infinite-dimensional systems; continuous-time and discrete-time systems; continuous continuous-time and discontinuous continuous-time systems; and hybrid systems involving a mixture of continuous and discrete dynamics.

Features

- First unified source of the analysis of all the major types of dynamical systems models
- Applicability of the developed theory is demonstrated by means of many specific examples and applications to important classes of systems, in areas such as power and energy, feedback control, artificial neural networks, digital signal processing and control, manufacturing, computer networks, and socio-economics

Fields of interest

Systems Theory, Control; Control Engineering; Ordinary Differential Equations

Target groups

Graduate students, researchers, and practitioners in engineering, applied mathematics, computer science, physical sciences, and economics

Type of publication

Graduate/Advanced undergraduate textbook

BIRKHAÜSER

Due September 2007

2007. Approx. 464 p. 30 illus. (Systems & Control: Foundations & Applications) Hardcover

► approx. * € (D) 64,15 | € (A) 65,95 | sFr 98,50
ISBN 978-0-8176-4486-4



9 780817 644864



A. N. Michel, University of Notre Dame, IN, USA; C. J. Herget, Herget Associates, Alameda, CA, USA

Intermediate Algebra and Analysis for Engineers and Scientists

Written for graduate and advanced undergraduate students in engineering and science, this classic book focuses primarily on set theory, algebra, and analysis. Useful as a course textbook, for self-study, or as a reference, the work is intended to familiarize engineering and science students with a great deal of pertinent and applicable mathematics in a rapid and efficient manner without sacrificing rigor.

Whereas these objectives for writing this book were certainly pertinent over twenty years ago when the work was first published, they are even more compelling now. Today's graduate students in engineering or science are expected to be more knowledgeable and sophisticated in mathematics than students in the past. Moreover, today's graduate students in engineering or science are expected to be familiar with a great deal of ancillary material (primarily in the computer science area), acquired in courses that did not even exist a couple of decades ago.

Features

- Allows students in engineering or science to become familiar with a great deal of pertinent mathematics in a rapid and efficient manner without sacrificing rigor
- Gives readers a unified overview of applicable mathematics, enabling them to choose additional, advanced topical courses in mathematics more intelligently
- Many exercises integrated into the text

From the contents

Fundamental Concepts.- Algebraic Structures.- Vector Spaces and Linear Transformations.- Finite-Dimensional Vector Spaces and Matrices.- Metric Spaces.

Fields of interest

Algebra; Functional Analysis; Engineering, general

Target groups

Beginning graduate and advanced undergraduate students in engineering and science

Type of publication

Graduate/Advanced undergraduate textbook

BIRKHAÜSER

Due August 2007

2007. Approx. 495 p., 48 illus. Softcover

► approx. * € (D) 41,20 | € (A) 42,35 | sFr 63,50
ISBN 978-0-8176-4706-3



9 780817 647063



W. A. Pogorzelski, University of Bialystok, Poland;
P. Wojtylak, Silesian University Katowice, Poland

Completeness Theory for Propositional Logics

The book develops the theory of one of the most important notions in the methodology of formal systems. Particularly, completeness plays an important role in propositional logic where many variants of the notion have been defined. Global variants of the notion mean the possibility of getting all correct and reliable schemata of inference. Its local variants refer to the notion of truth given by some semantics. A uniform theory of completeness in its general and local meaning is carried out and it generalizes and systematizes some variety of the notion of completeness such as Post-completeness, structural completeness and many others. This approach allows also for a more profound view upon some essential properties (e.g. two-valuedness) of propositional systems. For these purposes, the theory of logical matrices, and the theory of consequence operations is exploited.

Features

- Develops theory for one of the most important notions in the methodology of formal systems
- Allows a more profound view upon essential properties of propositional systems
- Theory of logical matrices and of consequence operations is exploited

From the contents

1. Basic notions: Propositional languages.- Abstract algebras.- Preliminary lattice-theoretical notions.- Propositional logics.- Brief exposition of the most important propositional logics.-
2. Semantic methods in propositional logic: Preordered sets.- Preordered algebras.- Logical matrices.- Adequacy.- Propositional logic and lattice theory.-
3. Completeness of propositional logic: Generalized completeness.

Fields of interest

Mathematical Logic and Foundations

Target groups

Graduates, postgraduates, and researchers, computer scientists, mathematicians, philosophers, linguists

Type of publication

Monograph

BIRKHAUSER

Due December 2007

2008. Approx. 180 p. (Studies in Universal Logic)
Softcover

► * € (D) 53,39 | € (A) 54,89 | sFr 85,00
ISBN 978-3-7643-8517-0



9 783764 385170



B. Roberts, University of Idaho, Moscow, ID, USA;
R. Schmidt, University of Oklahoma, Norman, OK, USA

Local Newforms for GSp(4)

Local Newforms for GSp(4) describes a theory of new- and oldforms for representations of GSp(4) over a non-archimedean local field. This theory considers vectors fixed by the paramodular groups, and singles out certain vectors that encode canonical information, such as L-factors and epsilon-factors, through their Hecke and Atkin-Lehner eigenvalues. While there are analogies to the GL(2) case, this theory is novel and unanticipated by the existing framework of conjectures. An appendix includes extensive tables about the results and the representations theory of GSp(4).

Contents

Summary.- Representation Theory.- Paramodular Vectors.- Zeta Integrals.- Non-supercuspidal Representations.- Hecke Operators.- Proofs of the Main Theorems.- Tables for Representations of GSp(4).- References.- Index.

Fields of interest

Number Theory; Topological Groups, Lie Groups

Target groups

Researchers and graduate students in number theory, representation theory, and Siegel modular forms theory

Type of publication

Monograph

Due August 2007

2007. VIII, 308 p. (Lecture Notes in Mathematics, Volume 1918) Softcover

► * € (D) 53,45 | € (A) 54,95 | sFr 82,00
ISBN 978-3-540-73323-2



9 783540 733232



W. Schwarz, University of Potsdam, Germany

40 Puzzles and Problems in Probability and Mathematical Statistics

The present book is based on the view that cognitive skills are best acquired by solving challenging, non-standard probability problems. The author's own experience, both in learning and in teaching, is that challenging problems often provide more, and longer lasting, inductive insights than plain-style deductions from general concepts. Problems help to develop, and to sharpen our intuition for important probabilistical concepts and tools such as conditioning or first-step analyses.

Many puzzles and problems presented here are either new within a problem solving context (although as topics in fundamental research they are of course long known) or are variations of classical problems which follow directly from elementary concepts. A small number of particularly instructive problems is taken from previous sources which in this case are generally given.

Features

- Contains far more problems of a statistical nature than the competition
- Will become a handy resource for professors looking for problems to assign for a course
- Of interest to undergraduate math students, as well as a more general audience of amateur scientists

Contents

Preface.- Notation and Terminology.- Problems.- Hints.- Solutions.- References.- Index.

Fields of interest

Probability Theory and Stochastic Processes

Target groups

Undergraduate math and statistics majors; general audience interested in math problems

Type of publication

Graduate/Advanced undergraduate textbook

Due November 2007

2008. Approx. 135 p. (Problem Books in Mathematics)
Hardcover

► approx. * € (D) 41,20 | € (A) 42,35 | sFr 63,50
ISBN 978-0-387-73511-5



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E. Sinibaldi, Scuola Normale Superiore, Pisa, Italy

Implicit preconditioned numerical schemes for the simulation of three-dimensional barotropic flows

Starting from a specific industrial problem related to the propellant flow within a liquid propellant rocket engine, a numerical method for simulating three-dimensional, generic barotropic flows in rotating frames is developed. A novel finite volume compressible approach for unstructured grids is proposed, suitably preconditioned for accurately dealing with nearly-incompressible flows. The time-advancing is performed by a novel, generic, linearized implicit scheme. A constructive procedure for solving the one-dimensional Riemann problem associated with a generic convex barotropic state law is presented as well. All the proposed numerical ingredients are validated against one-dimensional exact solutions or three-dimensional experimental data related to complex, industrial flows also involving cavitation phenomena.

Features

- ▶ A real, challenging industrial problem is addressed by hierarchically solving simpler issues, while keeping the formulation rather general
- ▶ Novel, fully compressible approach for the simulation of cavitating flows
- ▶ Self-contained presentation of the relevant mathematical and numerical ingredients
- ▶ Presents a constructive procedure for defining exact benchmarks

Fields of interest

Numerical Analysis; Mathematical Modeling and Industrial Mathematics

Target groups

Researchers and practitioners working in computational fluid dynamics, numerical analysis, aerospace engineering or applied mathematics

Type of publication

Monograph

S. Todorčević, Université Paris VII - CNRS, Paris, France

Walks on Ordinals and Their Characteristics

The walks on ordinals and analysis of their characteristics is a subject matter started by the author some twenty years ago in order to disprove a particular extension of the Ramsey theorem. A further analysis has shown however that the resulting method is quite useful in detecting critical mathematical objects in contexts where only rough classifications are possible. For example, many of the characteristics of walks on countable ordinals lead naturally to uncountable linear orderings whose Cartesian squares can be covered by countably many chains which turns out to be critical objects in the category of all linear orderings. Recently the method has led us to solutions to some other problems in a variety of disciplines such as for example a natural extension of the unconditional basic sequence problem from the Banach space theory or the famous L-space problem from topology.

Features

- ▶ Only full exposition of the method since its invention in the early 1980s
- ▶ In recent times the method is finding remarkable new applications

Contents

1. Introduction.-
 2. Walks on Countable Ordinals.-
 3. Metric Theory of Countable Ordinals.-
 4. Coherent Mappings and Trees.-
 5. The Square Bracket Operation on Countable Ordinals.-
 6. General Walks and Their Characteristics.-
 7. Square Sequences.-
 8. The Oscillation Mapping and The Square-Bracket Operation.-
 9. Unbounded Functions.-
 10. Higher Dimensions.-
- Bibliography.- Index.

Fields of interest

Combinatorics; Number Theory

Target groups

Graduates, postgraduates and researchers in combinatorial set theory, model theory, general topology, Banach space theory

Type of publication

Monograph

I. Veselić, Technical University Chemnitz, Germany

Existence and Regularity Properties of the Integrated Density of States of Random Schrödinger

The theory of random Schrödinger operators is devoted to the mathematical analysis of quantum mechanical Hamiltonians modeling disordered solids. Apart from its importance in physics, it is a multifaceted subject in its own right, drawing on ideas and methods from various mathematical disciplines like functional analysis, selfadjoint operators, PDE, stochastic processes and multi-scale methods.

The present text describes in detail a quantity encoding spectral features of random operators: the integrated density of states or spectral distribution function. Various approaches to the construction of the integrated density of states and the proof of its regularity properties are presented. The setting is general enough to apply to random operators on Riemannian manifolds with a discrete group action. References to and a discussion of other properties of the IDS are included, as are a variety of models beyond those treated in detail here.

Contents

- Random Operators.- Existence of the Integrated Density of States.- Wegner Estimate.- Wegner's Original Idea. Rigorous Implementation.- Lipschitz Continuity of the IDS.- Appendix: Properties of the Spectral Shift Function.

Fields of interest

Partial Differential Equations; Dynamical Systems and Ergodic Theory

Target groups

Researchers and graduate students

Type of publication

Monograph

BIRKHAUSER

Due July 2007

Only available in print

2007. Approx. 236 p. (Publications of the Scuola Normale Superiore / Theses (Scuola Normale Superiore), Volume 3) Softcover

▶ * € (D) 26,75 | € (A) 27,50 | sFr 42,00
ISBN 978-88-7642-310-9



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BIRKHAUSER

Due October 2007

2007. Approx. 350 p. (Progress in Mathematics, Volume 263) Hardcover

▶ * € (D) 64,09 | € (A) 65,89 | sFr 105,00
ISBN 978-3-7643-8528-6



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Due July 2007

2007. Approx. 130 p. (Lecture Notes in Mathematics, Volume 1917) Softcover

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ISBN 978-3-540-72689-0



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