Mathematics.

L. Ambrosio, G. Da Prato, A. Mennucci, Scuola Normale Superiore, Pisa, Italy

Introduction to Measure Theory and Integration

This textbook collects the notes for an introductory course in measure theory and integration. The course was taught by the authors to undergraduate students of the Scuola Normale Superiore, in the years 2000-2011. The goal of the course was to present, in a quick but rigorous way, the modern point of view on measure theory and integration, putting Lebesgue's Euclidean space theory into a more general context and presenting the basic applications to Fourier series, calculus and real analysis. The text can also pave the way to more advanced courses in probability, stochastic processes or geometric measure theory. Prerequisites for the book are a basic knowledge of calculus in one and several variables, metric spaces and linear algebra. All results presented here, as well as their proofs, are classical. The authors claim some originality only in the presentation and in the choice of the exercises. Detailed solutions to the exercises are provided in the final part of the book.

Features
- Good choice of exercises, supplemented with solutions
- Modern view point on measure theory and integration
- Classical results and proofs

Contents
- Measure spaces.
- Integration.
- Spaces of measurable functions.
- Hilbert spaces.
- Fourier series.
- Operations on measures.
- Appendix: Riesz representation theorem of the dual of C(K) and integrals depending on a parameter.
- Solutions to the exercises.

Fields of interest
- Measure and Integration

Target groups
- Graduate

Discount group
- P

Available
- $29.95

D. J. Benson, University of Aberdeen, UK; S. Iyengar, University of Nebraska, Lincoln, NE, USA; H. Krause, University of Bielefeld, Germany

Representations of Finite Groups: Local Cohomology and Support

The seminar focuses on a recent solution, by the authors, of a long standing problem concerning the stable module category (of not necessarily finite dimensional representations) of a finite group.

Features
- Covers material not addressed anywhere else in book form
- Gives an introduction to recent methods in representation theory of a fundamental nature that are likely to have a wide influence in neighboring subjects
- Exposition intended to be accessible to graduate and postdoctoral students in algebra and algebraic topology

Contents
- Preface.
- 1 Monday.
- 1.1 Overview.
- 1.2 Modules over group algebras.
- 1.3 Triangulated categories.
- 1.4 Exercises.
- 2 Tuesday.
- 2.1 Perfect complexes over commutative rings.
- 2.2 Brown representability and localization.
- 2.3 The stable module category of a finite group.
- 2.4 Exercises.
- 3 Wednesday.
- 3.1.
- 3.2 Koszul objects and support.
- 3.3 The homotopy category of injectives.
- 3.4 Exercises.
- 4 Thursday.
- 4.1 Stratifying triangulated categories.
- 4.2 Consequences of stratification.
- 4.3 The Klein four group.
- 4.4 Exercises.
- 5 Friday.
- 5.1 Localising subcategories of D(A).
- 5.2 Elementary abelian 2-groups.
- 5.3 Stratification for arbitrary finite groups.
- 5.4 Exercises.
- A Support for modules over commutative rings.
- Bibliography.
- Index.

Fields of interest
- Group Theory and Generalizations;
- Commutative Rings and Algebras;
- Associative Rings and Algebras

Target groups
- Graduate

Discount group
- P

Available
2012. X, 111 p. (Oberwolfach Seminars, Volume 43) Softcover
- $34.95
ISBN 978-3-0348-0259-8

B. Bergmann

M. Epple, Goethe-Universität, Frankfurt am Main, Germany; R. Ungar, Wolfgang Goethe University, Frankfurt am Main, Germany (Eds)

Transcending Tradition: Jewish Mathematicians in German Speaking Academic Culture

A companion publication to the international exhibition „Transcending Tradition: Jewish Mathematicians in German-Speaking Academic Culture“, the catalogue explores the working lives and activities of Jewish mathematicians in German-speaking countries during the period between the legal and political emancipation of the Jews in the 19th century and their persecution in Nazi Germany. It highlights the important role Jewish mathematicians played in all areas of mathematical culture during the Wilhelmine Empire and the Weimar Republic, and recalls their emigration, flight or death after 1933.

Features
- Comprehensive account of the life and work of German-Jewish mathematicians prior to and after 1933
- Includes many archival sources printed and translated for the first time
- Highlights the importance of German-Jewish mathematicians in mathematics and culture during the first half of the 20th century

Fields of interest
- History of Mathematical Sciences;
- History;
- History of Science

Target groups
- Research

Discount group
- P

Available
2012. XI, 270 p. 226 illus., 164 in color. Hardcover
- $59.95
ISBN 978-3-642-22463-8
Multiscale and Adaptivity: Modeling, Numerics and Applications
C.I.M.E. Summer School, Cetraro, Italy 2009
P. J. Davis, Brown University, Providence, RI, USA; R. H. Nochetto, University of Maryland, College Park, MD, USA; A. Quarteroni, EPFL, Lausanne, Switzerland; K. G. Siebert, University of Stuttgart, Germany; A. Veeser, Università degli Studi di Milano, Italy

The Mathematical Experience, Study Edition
When first published in the early 1980s, The Mathematical Experience presented a highly insightful overview of mathematics that effectively conveyed its power and beauty to a large audience of mathematicians and non-mathematicians alike. Following about a decade later, the study edition of the work supplemented the original material of the book with exercises to provide a self-contained treatment usable for the classroom.

Features
- Softcover reprint of a highly original and fascinating look at the world of mathematics
- Outstanding text for illuminating the study of math to an audience of non-mathematicians
- Contains a wealth of exercises to help students and educators investigate the nature and purpose of mathematics
- Includes epilogues written by the three authors, tying content to the modern state of mathematics

Contents

Fields of interest
Mathematics, general; Mathematics Education; History of Mathematical Sciences

Target groups
Lower undergraduate

Discount group
P

Harnack’s Inequality for Degenerate and Singular Parabolic Equations
Degenerate and singular parabolic equations have been the subject of extensive research for the last 25 years. Despite important achievements, the issue of the Harnack inequality for non-negative solutions to these equations, both of p-Laplacian and porous medium type, while raised by several authors, has remained basically open.

Features
- Topic is related to nonlinear parabolic PDEs which has been an active area of research in the last decades
- Main focus includes recent breakthroughs extending known results for the prototype equations to cover a whole class of nonlinear problems in a full scale of parameter values
- Focuses on important and interesting developments in nonlinear partial differential equations
- Includes energy estimates, expansion of positivity, intrinsic scaling and very elegant measure-theoretic results
- Techniques are very general and flexible and they can be applied in many different contexts

Contents

Fields of interest
Partial Differential Equations; Analysis; Special Functions

Target groups
Research

Discount group
P
S. S. Dragomir, Victoria University, Melbourne, VIC, Australia

Operator Inequalities of Ostrowski and Trapezoidal Type

Features
► Presents recent results concerning Ostrowski and Trapezoidal type inequalities for continuous functions of selfadjoint operators on complex Hilbert spaces ► Explores the fundamental results for polynomials in a linear operator, continuous functions of selfadjoint operators

Contents

Fields of interest
Partial Differential Equations; Approximations and Expansions; Numerical Analysis

Target groups
Research

Discount group
P

D.-Z. Du, University of Texas, Dallas, TX, USA; K.-I. Ko, Stony Brook University, NY, USA; X. Hu, Chinese Academy of Sciences, Beijing, China

Design and Analysis of Approximation Algorithms

This book is intended to be used as a textbook for graduate students studying theoretical computer science. It can also be used as a reference book for researchers in the area of design and analysis of approximation algorithms. Design and Analysis of Approximation Algorithms is a graduate course in theoretical computer science taught widely in the universities, both in the United States and abroad. There are, however, very few textbooks available for this course.

Features
► The technique-oriented approach provides a unified view of the design techniques for approximation algorithms ► Detailed algorithms, as well as complete proofs and analyses, are presented for each technique ► Numerous examples help the reader to better understand the design and analysis techniques ► Collects a great number of applications, many from recent research papers ► Includes a large collection of approximation algorithms of geometric problems

Contents

Fields of interest
Optimization; Algorithm Analysis and Problem Complexity

Target groups
Graduate

Discount group
P

L. Formaggia, F. Saleri, A. Veneziani, Politecnico di Milano, Italia

Solving Numerical PDE’s: Problems, Applications, Exercises

This book stems from the long standing teaching experience of the authors in the courses on Numerical Methods in Engineering and Numerical Methods for Partial Differential Equations given to undergraduate and graduate students of Politecnico di Milano (Italy), EPFL Lausanne (Switzerland), University of Bergamo (Italy) and Emory University (Atlanta, USA). It aims at introducing students to the numerical approximation of Partial Differential Equations (PDEs). One of the difficulties of this subject is to identify the right trade-off between theoretical concepts and their actual use in practice. With this collection of examples and exercises we try to address this issue by illustrating “academic” examples which focus on basic concepts of Numerical Analysis as well as problems derived from practical application which the student is encouraged to formalize in terms of PDEs, analyze and solve. The latter examples are derived from the experience of the authors in research project developed in collaboration with scientists of different fields (biology, medicine, etc.) and industry. We wanted this book to be useful both to readers more interested in the theoretical aspects and those more concerned with the numerical implementation.

Features
► Long standing teaching experience of the authors ► Introduction to the numerical approximation of Partial Differential Equations ► Practical applications Examples from different fields (biology, medicine) and industry

Fields of interest
Partial Differential Equations; Mathematics, general; Functional Analysis

Target groups
Upper undergraduate

Discount group
P
Approximation Algorithms and Semidefinite Programming

Semidefinite programs constitute one of the largest classes of optimization problems that can be solved with reasonable efficiency—both in theory and practice—and they play a key role in a variety of research areas, such as combinatorial optimization, approximation algorithms, computational complexity, graph theory, geometry, real algebraic geometry and quantum computing. This book is an introduction to selected aspects of semidefinite programming and its use in approximation algorithms.

Features
► First textbook treatment of an often-taught topic
► Combines in-depth treatment of classical material with coverage of very recent developments
► Every chapter comes with an extensive list of exercises

Contents

Fields of interest
Applications of Mathematics; Theory of Computation; Algorithm Analysis and Problem Complexity

Front Tracking for Hyperbolic Conservation Laws

Hyperbolic conservation laws are central in the theory of nonlinear partial differential equations and in science and technology. The reader is given a self-contained presentation using front tracking, which is also a numerical method. The multidimensional scalar case and the case of systems on the line are treated in detail. A chapter on finite differences is included. From the reviews: "It is already one of the few best digests on this topic. The present book is an excellent compromise between theory and practice. Students will appreciate the lively and accurate style." D. H. Holden, Norwegian University of Science and Technology, Trondheim, Norway; N. H. Risebro, University of Oslo, Blindern, Norway.

Features
► Contains a lot of theorems, with full proofs, a true piece of mathematical analysis
► Offers a detailed, rigorous, and self-contained presentation of the theory of hyperbolic conservation laws from the basic theory to the forefront of research
► Displays a lot of details and information about numerical approximation for the Cauchy problem
► Suitable for graduate courses in PDEs and numerical analysis

Contents

Fields of interest
Applications of Mathematics; Numerical Analysis; Theoretical, Mathematical and Computational Physics

Available
2012. XII, 252 p. 41 illus. Hardcover
► $59.95
ISBN 978-3-642-22014-2

Available
2012. XVIII, 474 p. (Springer Monographs in Mathematics) Hardcover
► approx. $89.95

Available
2011. XII, 368 p. 39 illus. (Applied Mathematical Sciences, Volume 152) Softcover
► $74.95
ISBN 978-3-642-23910-6
Inverse Limits
From Continua to Chaos

Inverse limits provide a powerful tool for constructing complicated spaces from simple ones. They also turn the study of a dynamical system consisting of a space and a self-map into a study of a (likely more complicated) space and a self-homeomorphism. In four chapters along with an appendix containing background material the authors develop the theory of inverse limits. The book begins with an introduction through inverse limits on [0,1] before moving to a general treatment of the subject. Special topics in continuum theory complete the book.

Features
► An elementary introduction to inverse limits through inverse limits on [0,1] is included in the first chapter
► The general theory of inverse limits is presented for compact Hausdorff spaces over directed sets using set valued functions in chapter two
► Special topics from continuum theory such as indecomposability are discussed in detail
► An appendix containing mostly an introduction to the topology of the Hilbert cube is included
► An extensive bibliography listing much of the literature on inverse limits is a part of the book

Contents

Fields of interest
Topology; Dynamical Systems and Ergodic Theory

Target groups
Research

Discount group
P

Due November 2011
► $99.00

S. Jukna, Vilnius University, Lithuania
Boolean Function Complexity

Advances and Frontiers

Boolean circuit complexity is the combinatorics of computer science and involves many intriguing problems that are easy to state and explain, even for the layman. This book is a comprehensive description of basic lower bound arguments, covering many of the gems of this “complexity Waterloo” that have been discovered over the past several decades, right up to results from the last year or two. Many open problems, marked as Research Problems, are mentioned along the way. The problems are mainly of combinatorial flavor but their solutions could have great consequences in circuit complexity and computer science. The book will be of interest to graduate students and researchers in the fields of computer science and discrete mathematics.

Features
► This is the first book covering the happening in circuit complexity during the last 20 years
► Includes non-standard topics, like graph complexity or circuits with arbitrary gates
► Includes about 40 open problems as potential research topics for students

Contents

Fields of interest
Information and Communication, Circuits; Theory of Computation; Combinatorics

Target groups
Graduate

Discount group
P

S. Jukna, Vilnius University, Lithuania
Boolean Function Complexity

Advances and Frontiers

Boolean circuit complexity is the combinatorics of computer science and involves many intriguing problems that are easy to state and explain, even for the layman. This book is a comprehensive description of basic lower bound arguments, covering many of the gems of this “complexity Waterloo” that have been discovered over the past several decades, right up to results from the last year or two. Many open problems, marked as Research Problems, are mentioned along the way. The problems are mainly of combinatorial flavor but their solutions could have great consequences in circuit complexity and computer science. The book will be of interest to graduate students and researchers in the fields of computer science and discrete mathematics.

Features
► This is the first book covering the happening in circuit complexity during the last 20 years
► Includes non-standard topics, like graph complexity or circuits with arbitrary gates
► Includes about 40 open problems as potential research topics for students

Contents

Fields of interest
Information and Communication, Circuits; Theory of Computation; Combinatorics

Target groups
Graduate

Discount group
P

S. Jukna, Vilnius University, Lithuania
Boolean Function Complexity

Advances and Frontiers

Boolean circuit complexity is the combinatorics of computer science and involves many intriguing problems that are easy to state and explain, even for the layman. This book is a comprehensive description of basic lower bound arguments, covering many of the gems of this “complexity Waterloo” that have been discovered over the past several decades, right up to results from the last year or two. Many open problems, marked as Research Problems, are mentioned along the way. The problems are mainly of combinatorial flavor but their solutions could have great consequences in circuit complexity and computer science. The book will be of interest to graduate students and researchers in the fields of computer science and discrete mathematics.

Features
► This is the first book covering the happening in circuit complexity during the last 20 years
► Includes non-standard topics, like graph complexity or circuits with arbitrary gates
► Includes about 40 open problems as potential research topics for students

Contents

Fields of interest
Information and Communication, Circuits; Theory of Computation; Combinatorics

Target groups
Graduate

Discount group
P

S. Jukna, Vilnius University, Lithuania
Boolean Function Complexity

Advances and Frontiers

Boolean circuit complexity is the combinatorics of computer science and involves many intriguing problems that are easy to state and explain, even for the layman. This book is a comprehensive description of basic lower bound arguments, covering many of the gems of this “complexity Waterloo” that have been discovered over the past several decades, right up to results from the last year or two. Many open problems, marked as Research Problems, are mentioned along the way. The problems are mainly of combinatorial flavor but their solutions could have great consequences in circuit complexity and computer science. The book will be of interest to graduate students and researchers in the fields of computer science and discrete mathematics.

Features
► This is the first book covering the happening in circuit complexity during the last 20 years
► Includes non-standard topics, like graph complexity or circuits with arbitrary gates
► Includes about 40 open problems as potential research topics for students

Contents

Fields of interest
Information and Communication, Circuits; Theory of Computation; Combinatorics

Target groups
Graduate

Discount group
P
R. A. Meyers, Larkspur, CA, USA (Ed.)
Mathematics of Complexity and Dynamical Systems

Contents

Fields of interest
Complex Systems; Simulation and Modeling; Dynamical Systems and Ergodic Theory

Target groups
Research

Discount group
P

T. Napier, Lehigh University, Bethlehem, PA, USA; M. Ramachandran, SUNY, Buffalo, NY, USA
An Introduction to Riemann Surfaces

This textbook presents a unified approach to compact and noncompact Riemann surfaces from the point of view of the so-called \( L^2 \bar{\delta} \)-method. This method is a powerful technique from the theory of several complex variables, and provides for a unique approach to the fundamentally different characteristics of compact and noncompact Riemann surfaces.

Features
- Presents a unified and competitive approach to compact and noncompact Riemann surfaces
- Includes continuing exercises that run throughout the book and lead to generalizations of the main theorems
- Will help expand and reinforce a student's knowledge of analysis, geometry, and topology

Contents
Preface.- Introduction.- Complex analysis in C.- Riemann Surfaces and the \( L^2 \bar{\delta} \)-Method for Scalar-Valued Forms.- The \( L^2 \bar{\delta} \)-Method in a Holomorphic Line Bundle.- Compact Riemann Surfaces.- Uniformization and Embedding of Riemann Surfaces.- Holomorphic Structures on Topological Surfaces.- Background Material on Analysis in \( \mathbb{R}^n \) and Hilbert Space Theory.- Background Material on Linear Algebra.- Background Material on Manifolds.- Background Material on Fundamental Groups, Covering Spaces, and (Co)homology.- Background Material on Sobolev Spaces and Regularity.- References.- Notation Index.- Subject Index.

Fields of interest
Several Complex Variables and Analytic Spaces; Global Analysis and Analysis on Manifolds; Analysis

Target groups
Research

Discount group
P

T. H. Otway, Yeshiva University, New York, NY, USA
The Dirichlet Problem for Elliptic-Hyperbolic Equations of Keldysh Type

Partial differential equations of mixed elliptic-hyperbolic type arise in diverse areas of physics and geometry, including fluid and plasma dynamics, optics, cosmology, traffic engineering, projective geometry, geometric variational theory, and the theory of isometric embeddings. And yet even the linear theory of these equations is at a very early stage. This text examines various Dirichlet problems which can be formulated for equations of Keldysh type, one of the two main classes of linear elliptic-hyperbolic equations. Open boundary conditions (in which data are prescribed on only part of the boundary) and closed boundary conditions (in which data are prescribed on the entire boundary) are both considered. Emphasis is on the formulation of boundary conditions for which solutions can be shown to exist in an appropriate function space. Specific applications to plasma physics, optics, and analysis on projective spaces are discussed. (From the preface)

Features
- The first text devoted entirely to the analysis of elliptic-hyperbolic equations of Keldysh type
- Includes the most recent methods of analysis in this field
- Numerous applications are included

Contents

Fields of interest
Partial Differential Equations

Target groups
Research

Discount group
P

Due October 2011

2012. XVII, 560 p. 42 illus. (Cornerstones) Hardcover
- $84.95

Print + eReference

In 3 volumes, not available separately
2012. 1775 p. 330 illus., 220 in color.
- approx. $600.00
  ISBN 978-1-4614-1805-4

T. Napier, Lehigh University, Bethlehem, PA, USA; M. Ramachandran, SUNY, Buffalo, NY, USA
An Introduction to Riemann Surfaces

This textbook presents a unified approach to compact and noncompact Riemann surfaces from the point of view of the so-called \( L^2 \bar{\delta} \)-method. This method is a powerful technique from the theory of several complex variables, and provides for a unique approach to the fundamentally different characteristics of compact and noncompact Riemann surfaces.

Features
- Presents a unified and competitive approach to compact and noncompact Riemann surfaces
- Includes continuing exercises that run throughout the book and lead to generalizations of the main theorems
- Will help expand and reinforce a student's knowledge of analysis, geometry, and topology

Contents
Preface.- Introduction.- Complex analysis in C.- Riemann Surfaces and the \( L^2 \bar{\delta} \)-Method for Scalar-Valued Forms.- The \( L^2 \bar{\delta} \)-Method in a Holomorphic Line Bundle.- Compact Riemann Surfaces.- Uniformization and Embedding of Riemann Surfaces.- Holomorphic Structures on Topological Surfaces.- Background Material on Analysis in \( \mathbb{R}^n \) and Hilbert Space Theory.- Background Material on Linear Algebra.- Background Material on Manifolds.- Background Material on Fundamental Groups, Covering Spaces, and (Co)homology.- Background Material on Sobolev Spaces and Regularity.- References.- Notation Index.- Subject Index.

Fields of interest
Several Complex Variables and Analytic Spaces; Global Analysis and Analysis on Manifolds; Analysis

Target groups
Research

Discount group
P

T. H. Otway, Yeshiva University, New York, NY, USA
The Dirichlet Problem for Elliptic-Hyperbolic Equations of Keldysh Type

Partial differential equations of mixed elliptic-hyperbolic type arise in diverse areas of physics and geometry, including fluid and plasma dynamics, optics, cosmology, traffic engineering, projective geometry, geometric variational theory, and the theory of isometric embeddings. And yet even the linear theory of these equations is at a very early stage. This text examines various Dirichlet problems which can be formulated for equations of Keldysh type, one of the two main classes of linear elliptic-hyperbolic equations. Open boundary conditions (in which data are prescribed on only part of the boundary) and closed boundary conditions (in which data are prescribed on the entire boundary) are both considered. Emphasis is on the formulation of boundary conditions for which solutions can be shown to exist in an appropriate function space. Specific applications to plasma physics, optics, and analysis on projective spaces are discussed. (From the preface)

Features
- The first text devoted entirely to the analysis of elliptic-hyperbolic equations of Keldysh type
- Includes the most recent methods of analysis in this field
- Numerous applications are included

Contents

Fields of interest
Partial Differential Equations

Target groups
Research

Discount group
P
Multidimensional Integral Equations and Inequalities

Since from more than a century, the study of various types of integral equations and inequalities has been focus of great attention by many researchers, interested both in theory and its applications. In particular, there exists a very rich literature related to the integral equations and inequalities and their applications. The present monograph is an attempt to organize recent progress related to the Multidimensional integral equations and inequalities, which we hope will widen the scope of their new applications. The field to be covered is extremely wide and it is nearly impossible to treat all of them here. The material included in the monograph is recent and hard to find in other books.

Features
- Contains the study of variety of multidimensional integral equations and inequalities, recently discovered, which find numerous applications in various branches of mathematics and can not be found in other book
- Is a valuable reference for results about multidimensional integral equations and inequalities for use in some applications, in various other branches of mathematics
- Deals with a variety of new results, which find large number of applications in various other branches of mathematics, which are still in the original papers in journals

Contents
Integral equations in two variables.- Integral inequalities and equations in two and three variables.- Mixed integral equations and inequalities.- Parabolic-type integrodifferential equations.- Multivariable sum-difference equations and inequalities.

Fields of interest
Analysis; Integral Equations

Target groups
Research

Discount group
P

Due November 2011
[$99.00 USD]

Modern Optimization Techniques with Applications in Electric Power Systems

This book presents the application of some AI related optimization techniques in the operation and control of electric power systems. With practical applications and examples the use of functional analysis, simulated annealing, Tabu-search, Genetic algorithms and fuzzy systems for the optimization of power systems is discussed in detail. Preliminary mathematical concepts are presented before moving to more advanced material.

Features
- Presents the application of some artificial intelligent optimization techniques in electric power system operation and control
- Presents, with practical applications and examples, The application of Functional Analysis, simulated annealing, Tabu-search, Genetic algorithm and fuzzy systems on the optimization of power system operation and control

Contents

Fields of interest
Operator Theory; Computational Science and Engineering; Operations Research, Management Science

Target groups
Graduate

Discount group
P

Due January 2012
2012. XIV, 486 p. 80 illus., 60 in color. (Energy Systems) Hardcover
[$124.00 USD]
ISBN 978-1-4614-1751-4

D. Scholz, Georg-August-University Göttingen, Germany