Non Homogeneous Boundary Value Problems And Applications Volume Ii Grundlehren Der Mathematischen Wissenschaften

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Wavelet Methods — Elliptic Boundary Value Problems and Control Problems - Angela Kunoth 2012-12-06

Diese Monographie spannt einen Bogen rund um die aktuelle Thematik Wavelets, um neueste Entwicklungen anhand aufeinander aufbauender Probleme darzustellen und das konzeptuelle Potenzial von Waveletmethoden für Partielle Differentialgleichungen zu demonstrieren.

Topological Vector Spaces II - Gottfried Köthe 2012-12-06

In the preface to Volume One I promised a second volume which would contain the theory of linear mappings and special classes of spaces im portant in analysis. It took me nearly twenty years to fulfill this promise, at least to some extent. To the six chapters of Volume One I added two new chapters, one on linear mappings and duality (Chapter Seven), the second on spaces of linear mappings (Chapter Eight). A glance at the Contents and the short introductions to the two new chapters will give a fair impression of the material included in this volume. I regret that I had to give up my intention to write a third chapter on nuclear spaces. It seemed impossible to include the recent deep results in this field without creating a great further delay. A substantial part of this book grew out of lectures I held at the Mathematics Department of the University of Maryland· during the academic years 1963-1964, 1967-1968, and 1971-1972. I would like to express my gratitude to my colleagues J. BRACE, S. GOLDBERG, J. HORVATH, and G. MALTESE for many stimulating and helpful discussions during these years. I am particularly indebted to H. JARCHOW (Ziirich) and D. KEIM (Frankfurt) for many suggestions and corrections. Both have read the whole manuscript. N. ADASCH (Frankfurt), V. EBERHARDT (Miinchen), H. MEISE (Diisseldorf), and R. HOLLSTEIN (Paderborn) helped with important observations.

Boundary Value Problems of Applied

Mathematics - John L. Troutman 2017-06-21
This text is geared toward advanced undergraduates and graduate students in mathematics who have some familiarity with multidimensional calculus and ordinary differential equations. Includes a substantial number of answers to selected problems. 1994 edition.

Analytic Semigroups and Semilinear Initial Boundary Value Problems - Kazuaki Taira 1995-10-19
This book provides a careful and accessible exposition of the function analytic approach to initial boundary value problems for semilinear parabolic differential equations. It focuses on the relationship between two interrelated subjects in analysis: analytic semigroups and initial boundary value problems.

Harmonic Analysis on Semi-Simple Lie Groups I - Garth Warner 2012-12-06
The representation theory of locally compact groups has been vig orously developed in the past twenty-five years or so; of the various branches of this theory, one of the most attractive (and formidable) is the representation theory of semi-simple Lie groups which, to a great extent, is the creation of a single man: Harish-Chandra. The chief objective of the present volume and its immediate successor is to provide a reasonably self-contained introduction to Harish-Chandra's theory. Granting cer tain basic prerequisites (cf. infra), we have made an effort to give full details and complete proofs of the theorems on which the theory rests. The structure of this volume and its successor is as follows. Each book is divided into chapters; each chapter is divided into sections; each section into numbers. We then use the decimal system of reference; for example, 1. 3. 2 refers to the second number in the third section of the first chapter. Theorems, Propositions, Lemmas, and Corollaries are listed consecutively throughout any given number. Numbers which are set in fine print may be omitted at a first reading.

There are a variety of Exam ples scattered throughout the text; the reader, if he is so inclined, can view them as exercises ad libitum. The Appendices to the text collect certain ancillary results which will be used on and off in the systematic exposi tion; a reference of the form A2.

Non-homogeneous Boundary Value Problems and Applications - Jacques Louis Lions 1972

Non-Homogeneous Boundary Value Problems and Applications - Jacques Louis Lions 2011-11-12

I. In this second volume, we continue at first the study of non homogeneous boundary value problems for particular classes of evolu tion equations. 1 In Chapter 4 , we study parabolic operators by the method of Agranovitch-Vishik [lJ; this is step (i) (Introduction to Volume I, Section 4), i.e. the study of regularity. The next steps: (ii) transposition, (iii) interpolation, are similar in principle to those of Chapter 2, but involve rather considerable additional technical difficulties. In Chapter 5, we study hyperbolic operators or operators well defined in thesense of Petrowski or Schroedinger. Our regularity results (step (i)) seem to be new. Steps (ii) and (iii) are all3.logous to those of the parabolic case, except for certain technical differences. In Chapter 6, the results of Chapter'> 4 and 5 are applied to the study of optimal control problems for systems governed by evolution equations, when the control appears in the boundary conditions (so that non-homogeneous boundary value problems are the basic tool of this theory). Another type of application, to the characterization of "all" well-posed problems for the operators in question, is given in the Ap pendix. Still other applications, for example to numerical analysis, will be given in Volume 3.

Modular Units - D. Kubert 2013-06-29

In the present book, we have put together the basic theory of the units and cuspidal divisor class group in the modular function fields, developed over the past few years. Let i) be the upper half plane, and N a positive integer. Let r(N) be the subgroup of SL (Z) consisting of those matrices == 1 mod N. Then r(N)\i) 2 is complex analytic isomorphic to an affine curve YeN), whose compactifi cation is called the modular curve X(N). The affine ring of regular functions on yeN) over C is the integral closure of C[j] in the function field of X(N) over C. Here j is the classical modular function. However, for arithmetic applications, one considers the curve as defined over the cyclotomic field Q(JlN) of N-th roots of unity, and one takes the integral closure either of Q[j] or Z[j], depending on how much arithmetic one wants to throw in. The units in these rings consist of those modular functions which have no zeros or poles in the upper half plane. The points of X(N) which lie at infinity, that is which do not correspond to points on the above affine set, are called the cusps, because of the way they look in a fundamental domain in the upper half plane. They generate a subgroup of the divisor class group, which turns out to be finite, and is called the cuspidal divisor class group.

Hodge Decomposition - A Method for Solving Boundary Value Problems - Günter Schwarz 2006-11-14

Hodge theory is a standard tool in characterizing differ- ential complexes and the topology of manifolds. This book is a study of the Hodge-Kodaira and related decompositions on manifolds with boundary under mainly analytic aspects. It aims at developing a method for solving boundary value problems. Analysing a Dirichlet form on the exterior algebra bundle allows to give a refined version of the classical decomposition results of Morrey. A projection technique leads to existence and regularity theorems for a wide class of boundary value problems for differential forms and vector fields. The book links aspects of the geometry of manifolds with the theory of partial differential equations. It is intended to be comprehensible for graduate students and mathematicians working in either of these fields.

Absolute Analysis - Frithjof Nevanlinna 2012-12-06

The first edition of this book, published in German, came into being as the result of lectures which the authors held over a period of several years since 1953 at the Universities of Helsinki and Zurich. The Introduction, which follows, provides information on what moti vated our presentation of an absolute, coordinate- and dimension-free infinitesimal calculus. Little previous knowledge is presumed of the reader. It can be recom mended to students familiar with the usual structure, based on co ordinates, of the elements of analytic geometry, differential and integral calculus and of the theory of differential equations. We are indebted to H. Keller, T. Klemola, T. Nieminen, Ph. Tondeur and K. 1. Virtanen, who read our presentation in our first manuscript, for important critical remarks. The present new English edition deviates at several points from the first edition (d. Introduction). Professor I. S. Louhivaara has from the beginning to the end taken part in the production of the new edition and has advanced our work by suggestions on both content and form. For his important support we wish to express our hearty thanks. We are indebted also to W. Greub and to H. Haahti for various valuable remarks. Our manuscript for this new edition has been translated into English by Doctor P. Emig. We express to him our gratitude for his careful interest and skillful attention during this work.

Semigroups, Boundary Value Problems and Markov Processes - Kazuaki Taira 2014-08-07

A careful and accessible exposition of functional analytic methods in stochastic analysis is provided in this book. It focuses on the interrelationship between three subjects in analysis: Markov processes, semi groups and elliptic boundary value problems. The author studies a general class of elliptic boundary value problems for second-order, Waldenfels integro-differential operators in partial differential equations and proves that this class of elliptic boundary value problems provides a general class of Feller semigroups in functional analysis. As an application, the author constructs a general class of Markov processes in probability in which a Markovian particle moves both by jumps and continuously in the state space until it 'dies' at the time when it reaches the set where the particle is definitely absorbed. Augmenting the 1st edition published in 2004, this edition includes four new chapters and eight re-worked and expanded chapters. It is amply illustrated and all chapters are rounded off with Notes and Comments where bibliographical references are primarily discussed. Thanks to the kind feedback from many readers, some errors in the first edition have been corrected. In order to keep the book up-to-date, new references have been added to the bibliography. Researchers and graduate students interested in PDEs, functional analysis and probability will find this volume useful.

Theory of Stein Spaces - H. Grauert 2013-03-14

1. The classical theorem of Mittag-Leffler was generalized to the case of several complex variables by Cousin in 1895. In its one variable version this says that, if one prescribes the principal parts of a merom orphic function on a domain in the complex plane e, then there exists a meromorphic function defined on that domain having exactly those principal parts. Cousin and subsequent authors could only prove the analogous theorem in several variables for certain types of domains (e. g. product domains where each factor is a domain in the complex plane). In fact it turned out that this problem can not be solved on an arbitrary domain in em, m ~ 2. The best known example for this is a "notched" bicylinder in 2 2 e . This is obtained by removing the set { (z , z) E e 11 z I ~ !, I z 1 ~ !}, from 1 2 1 2 2 the unit bicylinder, ~ :={(z , z

) E e llz1

NON HOMOGENEOUS BOUNDARY VALUE PROBLEMS AND APPLICATIONS [Vol 1-3]. - JL. LIONS 1972

Theta Functions - Jun-ichi Igusa 2012-12-06

The theory of theta functions has a long history; for this, we refer A. Krazer and W. Wirtinger the reader to an encyclopedia article by ("Sources" [9]). We shall restrict ourselves to postwar, i. e., after 1945, periods. Around 1948/49, F. Conforto, c. L. Siegel, A. Well reconsidered the main existence theorems of theta functions and found natural proofs for them. These are contained in Conforto: Abelsche Funktionen und algebraische Geometrie, Springer (1956); Siegel: Analytic functions of several complex variables, Lect. Notes, I.A.S. (1948/49); Well: Theoremes fondamentaux de la theorie des fonctions theta, Sem. Bourbaki, No. 16 (1949). The complete account of Weil's method appeared in his book of 1958 [20]. The next important achievement was the theory of compacti fication of the quotient variety of Siegel's upper-half space by a modular group. There are many ways to compactify the quotient variety; we are talking about what might be called a standard compactification. Such a compactification was obtained first as a Hausdorff space by I. Satake in "On the compactification of the Siegel space", J. Ind. Math. Soc. 20, 259-281 (1956), and as a normal projective variety by W.L. Baily in 1958 [1]. In 1957/58, H. Cartan took up this theory in his seminar [3]; it was shown that the graded ring of modular forms relative to the given modular group is a normal integral domain which is finitely generated over C

Nonlinear Analysis and Boundary Value Problems - Iván Area 2019-09-19

This book is devoted to Prof. Juan J. Nieto, on the occasion of his 60th birthday. Juan José Nieto Roig (born 1958, A Coruña) is a Spanish mathematician, who has been a Professor of Mathematical Analysis at the University of

Santiago de Compostela since 1991. His most influential contributions to date are in the area of differential equations. Nieto received his degree in Mathematics from the University of Santiago de Compostela in 1980. He was then awarded a Fulbright scholarship and moved to the University of Texas at Arlington where he worked with Professor V. Lakshmikantham. He received his Ph.D. in Mathematics from the University of Santiago de Compostela in 1983. Nieto's work may be considered to fall within the ambit of differential equations, and his research interests include fractional calculus, fuzzy equations and epidemiological models. He is one of the world's most cited mathematicians according to Web of Knowledge, and appears in the Thompson Reuters Highly Cited Researchers list. Nieto has also occupied different positions at the University of Santiago de Compostela, such as Dean of Mathematics and Director of the Mathematical Institute. He has also served as an editor for various mathematical journals, and was the editor-in-chief of the journal Nonlinear Analysis: Real World Applications from 2009 to 2012. In 2016, Nieto was admitted as a Fellow of the Royal Galician Academy of Sciences. This book consists of contributions presented at the International Conference on Nonlinear Analysis and Boundary Value Problems, held in Santiago de Compostela, Spain, 4th-7th September 2018. Covering a variety of topics linked to Nieto's scientific work, ranging from differential, difference and fractional equations to epidemiological models and dynamical systems and their applications, it is primarily intended for researchers involved in nonlinear analysis and boundary value problems in a broad sense.

Vorlesungen über die hypergeometrische Funktion - Felix Klein 2013-04-17

Bei der Herausgabe der KLEINschen Vorlesung über die hyper geometrische Funktion erschienen nur zwei Wege gangbar: Entweder eine durchgreifende Umarbeitung, auch im großen, oder eine möglichst weitgehende

Erhaltung der ursprünglichen Form. Vor allem auch aus historischen Gründen wurde der letztere Weg beschritten. Daher ist die Anordnung des Stoffes erhalten geblieben; e, s ist nur, von kleinen Änderungen abgesehen, ein Exkurs über homogene Schreibweise aus der KLEINschen Vorlesung über lineare Differentialgleichungen ein gefügt, ferner sind die Schlußbemerkungen zur geometrischen Theorie im Falle komplexer Exponenten als durch die Arbeiten von F. SCHILLING überholt, weggelassen. Aus dem obengenannten Grunde sind beispiels weise auch Entwicklungen beibehalten worden, die heute schon dem Anfänger geläufig sind (etwa die Ausführungen über stereographische Projektion). In Rücksicht auf möglichste Erhaltung der KLEINschen Darstellung sind ferner Hinweise des Herausgebers auf inzwischen ge machte Fortschritte der Wissenschaft vom Texte getrennt als Anmerkun gen am Schluß zusammengestellt. Diese Hinweise erheben aber in keiner Weise den Anspruch auf Vollständigkeit. Bei der nicht zu um gehenden Revision des Textes im einzelnen ist, dem oben angegebenen Gesichtspunkt entsprechend, möglichste Wahrung des persönlichen KLEINschen Stils angestrebt. übrigens habe ich darauf Bedacht genommen, auch dem A nlänger die Lektüre durch Anmerkungen und durch Nachweise der KLEINschen Zitate zu erleichtern. Denn zweifellos bieten gerade diese Vorlesungen eine treffliche Ergänzung und Weiterführung dessen, was der Studierende mittleren Semesters an Geometrie und Funktionentheorie kennen gelernt hat.

Boundary Value Problems and Markov Processes - Kazuaki Taira 2009-06-30

This is a thorough and accessible exposition on the functional analytic approach to the problem of construction of Markov processes with Ventcel' boundary conditions in probability theory. It presents new developments in the theory of singular integrals.

Essays in Commutative Harmonic Analysis - C. C. Graham 2012-12-06

This book considers various spaces and algebras made up of functions, measures, and other objects-situated always on one or another locally compact abelian group, and studied in the light of the Fourier transform. The emphasis is on the objects themselves, and on the structure-in-detail of the spaces and algebras. A mathematician needs to know only a little about Fourier analysis on the commutative groups, and then may go many ways within the large subject of harmonic analysis-into the beautiful theory of Lie group representations, for example. But this book represents the tendency to linger on the line, and the other abelian groups, and to keep asking questions about the structures thereupon. That tendency, pursued since the early days of analysis, has defined a field of study that can boast of some impressive results, and in which there still remain unanswered questions of compelling interest. We were influenced early in our careers by the mathematicians Jean-Pierre Kahane, Yitzhak Katznelson, Paul Malliavin, Yves Meyer, Joseph Taylor, and Nicholas Varopoulos. They are among the many who have made the field a productive meeting ground of probabilistic methods, number theory, diophantine approximation, and functional analysis. Since the academic year 1967-1968, when we were visitors in Paris and Orsay, the field has continued to see interesting developments. Let us name a few. Sam Drury and Nicholas Varopoulos solved the union problem for Helson sets, by proving a remarkable theorem (2.1.3) which has surely not seen its last use.

Lectures on Algebraic Topology - Albrecht Dold 2012-12-06

This is essentially a book on singular homology and cohomology with special emphasis on products and manifolds. It does not treat homotopy theory except for some basic notions, some examples, and some applica tions of (co-

)homology to homotopy. Nor does it deal with general(-ised) homology, but many formulations and arguments on singular homology are so chosen that they also apply to general homology. Because of these absences I have also omitted spectral sequences, their main applications in topology being to homotopy and general (co-)homology theory. Cech cohomology is treated in a simple ad hoc fashion for locally compact subsets of manifolds; a short systematic treatment for arbitrary spaces, emphasizing the universal property of the Cech-procedure, is contained in an appendix. The book grew out of a one-year's course on algebraic topology, and it can serve as a text for such a course. For a shorter basic course, say of half a year, one might use chapters II, III, IV (§§ 1-4), V (§§ 1-5, 7, 8), VI (§§ 3, 7, 9, 11, 12). As prerequisites the student should know the elementary parts of general topology, abelian group theory, and the language of categories - although our chapter I provides a little help with the latter two. For pedagogical reasons, I have treated integral homology only up to chapter VI; if a reader or teacher prefers to have general coefficients from the beginning he needs to make only minor adaptions.

Lectures from Markov Processes to Brownian Motion - Kai Lai Chung 2013-11-11

This book evolved from several stacks of lecture notes written over a decade and given in classes at slightly varying levels. In transforming the over lapping material into a book, I aimed at presenting some of the best features of the subject with a minimum of prerequisities and technicalities. (Needless to say, one man's technicality is another's professionalism.) But a text frozen in print does not allow for the latitude of the classroom; and the tendency to expand becomes harder to curb without the constraints of time and audience. The result is that this volume contains more topics and details than I had intended, but I hope the forest is still visible with the trees. The book begins at the beginning with the Markov property, followed quickly by the introduction of option al times and martingales. These three topics in the discrete parameter setting are fully discussed in my book A Course In Probability Theory (second edition, Academic Press, 1974). The latter will be referred to throughout this book as the Course, and may be considered as a general background; its specific use is limited to the mate rial on discrete parameter martingale theory cited in § 1. 4. Apart from this and some dispensable references to Markov chains as examples, the book is self-contained.

Problems and Theorems in Analysis II - George Polya 1997-12-11

Few mathematical books are worth translating 50 years after original publication. Polyá-Szegö is one! It was published in German in 1924, and its English edition was widely acclaimed when it appeared in 1972. In the past, more of the leading mathematicians proposed and solved problems than today. Their collection of the best in analysis is a heritage of lasting value.

Numerical Methods for Nonlinear Elliptic Differential Equations - Klaus Boehmer 2010-10-07

Nonlinear elliptic problems play an increasingly important role in mathematics, science and engineering, creating an exciting interplay between the subjects. This is the first and only book to prove in a systematic and unifying way, stability, convergence and computing results for the different numerical methods for nonlinear elliptic problems. The proofs use linearization, compact perturbation of the coercive principal parts, or monotone operator techniques, and approximation theory. Examples are given for linear to fully nonlinear problems (highest derivatives occur nonlinearly) and for the most important space discretization methods: conforming and nonconforming finite element, discontinuous Galerkin, finite difference, wavelet (and, in a volume to follow, spectral and meshfree) methods. A number of specific long open problems are solved here: numerical methods for fully nonlinear elliptic problems, wavelet and meshfree methods for nonlinear problems, and more general nonlinear boundary conditions. We apply it to all these problems and methods, in particular to eigenvalues, monotone operators, quadrature approximations, and Newton methods. Adaptivity is discussed for finite element and wavelet methods. The book has been written for graduate students and scientists who want to study and to numerically analyze nonlinear elliptic differential equations in Mathematics, Science and Engineering. It can be used as material for graduate courses or advanced seminars.

Function Theory in the Unit Ball of Cn - W. Rudin 2012-12-06

Around 1970, an abrupt change occurred in the study of holomorphic functions of several complex variables. Sheaves vanished into the back ground, and attention was focused on integral formulas and on the "hard analysis" problems that could be attacked with them: boundary behavior, complex-tangential phenomena, solutions of the J-problem with control over growth and smoothness, quantitative theorems about zero-varieties, and so on. The present book describes some of these developments in the simple setting of the unit ball of en. There are several reasons for choosing the ball for our principal stage. The ball is the prototype of two important classes of regions that have been studied in depth, namely the strictly pseudoconvex domains and the bounded symmetric ones. The presence of the second structure (i.e., the existence of a transitive group of automorphisms) makes it possible to develop the basic machinery with a minimum of fuss and bother. The principal ideas can be presented quite concretely and explicitly in the ball, and one can quickly arrive at specific theorems of obvious interest. Once one has seen these in this simple context, it should be much easier to learn the more complicated machinery (developed largely by Henkin and his co-workers) that extends them to arbitrary strictly pseudoconvex domains. In some parts of the book (for instance, in Chapters 14-16) it would, however, have been unnatural to confine our attention exclusively to the ball, and no significant simplifications would have resulted from such a restriction.

Harmonic Analysis on Semi-Simple Lie Groups II - Garth Warner 2012-12-06

Linear and Quasi-linear Evolution Equations in Hilbert Spaces - Pascal Cherrier 2022-07-14 This book considers evolution equations of hyperbolic and parabolic type. These equations are studied from a common point of view, using elementary methods, such as that of energy estimates, which prove to be quite versatile. The authors emphasize the Cauchy problem and present a unified theory for the treatment of these equations. In particular, they provide local and global existence results, as well as strong well-posedness and asymptotic behavior results for the Cauchy problem for quasi-linear equations. Solutions of linear equations are constructed explicitly, using the Galerkin method; the linear theory is then applied to quasi-linear equations, by means of a linearization and fixed-point technique. The authors also compare hyperbolic and parabolic problems, both in terms of singular perturbations, on compact time intervals, and asymptotically, in terms of the diffusion phenomenon, with new results on decay estimates for strong solutions of homogeneous quasi-linear equations of each type. This textbook presents a valuable introduction to topics in the theory of evolution equations, suitable for advanced graduate students. The exposition is largely self-contained. The initial chapter reviews the essential material from functional analysis. New ideas are introduced along with their context. Proofs are detailed and carefully presented. The book concludes with a chapter on applications of the theory to Maxwell's equations and von Karman's equations.

Partial Differential Equations and Boundary-Value Problems with Applications - Mark A. Pinsky 2011

Building on the basic techniques of separation of variables and Fourier series, the book presents the solution of boundary-value problems for basic partial differential equations: the heat equation, wave equation, and Laplace equation, considered in various standard coordinate systems--rectangular, cylindrical, and spherical. Each of the equations is derived in the three-dimensional context; the solutions are organized according to the geometry of the coordinate system, which makes the mathematics especially transparent. Bessel and Legendre functions are studied and used whenever appropriate throughout the text. The notions of steady-state solution of closely related stationary solutions are developed for the heat equation; applications to the study of heat flow in the earth are presented. The problem of the vibrating string is studied in detail both in the Fourier transform setting and from the viewpoint of the explicit representation (d'Alembert formula). Additional chapters include the numerical analysis of solutions and the method of Green's functions for solutions of partial differential equations. The exposition also includes asymptotic methods (Laplace transform and stationary phase). With more than 200 working examples and 700 exercises (more than 450 with answers), the book is suitable for an undergraduate course in partial differential equations.

Functional Analysis - Kosaku Yosida 2013-03-09

The present book is based on lectures given by the author at the University of Tokyo during the past ten years. It is intended as a textbook to be studied by students on their own or to be used in a course on Functional Analysis, i. e. , the general theory of linear operators in function spaces together with salient features of its application to diverse fields of modern and classical analysis. Necessary prerequisites for the reading of this book are summarized, with or without proof, in Chapter 0 under titles: Set Theory, Topo logical Spaces, Measure Spaces and Linear Spaces. Then, starting with the chapter on Semi-norms, a general theory of Banach and Hilbert spaces is presented in connection with the theory of generalized functions of S. L. SOBOLEV and L. SCHWARTZ. While the book is primarily addressed to graduate students, it is hoped it might prove useful to research mathe maticians, both pure and applied. The reader may pass, e. g. , from Chapter IX (Analytical Theory of Semi-groups) directly to Chapter XIII (Ergodic Theory and Diffusion Theory) and to Chapter XIV (Integration of the Equation of Evolution). Such materials as "Weak Topologies and Duality in Locally Convex Spaces" and "Nuclear Spaces" are presented in the form of the appendices to Chapter V and Chapter X, respectively. These might be skipped for the first reading by those who are interested rather in the application of linear operators.

Several Complex Variables - Mathematical sciences research institute (Berkeley, Calif.). 1999

Expository articles on Several Complex Variables and its interactions with PDEs, algebraic geometry, number theory, and differential geometry, first published in 2000.

Differential Inclusions - J.-P. Aubin 2012-12-06

A great impetus to study differential inclusions came from the development of Control Theory, i.e. of dynamical systems x'(t) = f(t, x(t), u(t)), x(O)=xo "controlled" by parameters u(t) (the "controls"). Indeed, if we introduce the set-valued map F(t, x)= {f(t, x, u)}ueu then solutions to the differential equations (*) are solutions to the "differen tial inclusion" (**) x'(t)EF(t, x(t)), x(O)=xo in which the controls do not appear explicitely. Systems Theory provides dynamical systems of the form d x'(t)=A(x(t)) dt (B(x(t))+ C(x(t)); x(O)=xo in which the velocity of the state of the system depends not only upon the x(t) of the system at time t, but also on variations of observations state B(x(t)) of the state. This is a particular case of an implicit differential equation f(t, x(t), x'(t)) = 0 which can be regarded as a differential inclusion (**), where the right-hand side F is defined by F(t, x)= {vlf(t, x, v)=O}. During the 60's and 70's, a special class of differential inclusions was thoroughly investigated: those of the form X'(t)E - A(x(t)), x (0) =xo where A is a "maximal monotone" map. This class of inclusions contains the class of "gradient inclusions" which generalize the usual gradient equations x'(t) = - VV(x(t)), x(O)=xo when V is a differentiable "potential". 2 Introduction There are many instances when potential functions are not differentiable

Boundary Value Problems for Operator Differential Equations - Myroslav L. Gorbachuk 2012-12-06

Elliptic Differential Equations - Wolfgang Hackbusch 2017-06-01

This book simultaneously presents the theory and the numerical treatment of elliptic boundary value problems, since an understanding of the theory is necessary for the numerical analysis of the discretisation. It first discusses the Laplace equation and its finite difference discretisation before addressing the general linear differential equation of second order. The variational formulation together with the necessary background from functional analysis provides the basis for the Galerkin and finite-element methods, which are explored in detail. A more advanced chapter leads the reader to the theory of regularity. Individual chapters are devoted to singularly perturbed as well as to elliptic eigenvalue problems. The book also presents the Stokes problem and its discretisation as an example of a saddle-point problem taking into account its relevance to applications in fluid dynamics.

Analysis and Numerics of Partial Differential Equations - Franco Brezzi 2012-12-22

This volume is a selection of contributions offered by friends, collaborators, past students in memory of Enrico Magenes. The first part gives a wide historical perspective of Magenes' work in his 50-year mathematical career; the second part contains original research papers, and shows how ideas, methods, and techniques introduced by Magenes and his collaborators still have an impact on the current research in Mathematics.

Non-Homogeneous Boundary Value Problems and Applications - Jacques Louis Lions 2014-03-12

1. We describe, at first in a very formaI manner, our essential aim. n Let m be an op en subset of R , with boundary am. In m and on am we introduce, respectively, linear differential operators P and Qj' 0 ~ i ~ 'V. By "non-homogeneous boundary value problem" we mean a problem of the following type: let f and gj' 0 ~ i ~ 'v, be given in function space s F and G , F being a space" on m" and the G/ s spaces" on am" ; j we seek u in a function space u/t "on m" satisfying (1) Pu = f in m, (2) Qju = gj on am, 0 ~ i ~ 'v«])). Qj may be identically zero on part of am, so that the number of boundary conditions may depend on the part of am considered 2. We take as "working hypothesis" that, for fEF and gjEG , j the problem (1), (2) admits a unique solution u E U/t, which depends 3 continuously on the data . But for alllinear probIems, there is a large number of choiees for the space s u/t and {F; G} (naturally linke d together). j Generally speaking, our aim is to determine families of spaces 'ft and {F; G}, associated in a "natural" way with problem (1), (2) and con j venient for applications, and also all possible choiees for u/t and {F; G} j in these families.

Non-homogeneous Boundary Value Problems

and Applications - Jacques Louis Lions 1973

Problems and Theorems in Analysis I - George Polya 2012-12-06
From the reviews: "The work is one of the real classics of this century; it has had much influence on teaching, on research in several branches of hard analysis, particularly complex function theory, and it has been an essential indispensable source book for those seriously interested in mathematical problems." Bulletin of the American Mathematical Society
Baer *-Rings - Sterling K. Berberian 2010-10-27
A systematic exposition of Baer *-Rings, with emphasis on the ring-theoretic and lattice-theoretic foundations of von Neumann algebras. Equivalence of projections, decompositio into types; connections with AW*-algebras, *-regular rings, continuous geometries. Special topics include the theory of finite Baer *-rings (dimension theory, reduction theory, embedding in *-regular rings) and matrix rings over Baer *-rings. Written to be used as a textbook as well as a reference, the book includes more than 400 exercises, accompanied by notes, hints, and references to the literature. Errata and comments from the author have been added at the end of the present reprint (2nd printing 2010).
Algebraic Systems - Anatolij Ivanovic Mal'cev 2012-12-06
As far back as the 1920's, algebra had been accepted as the science studying the properties of sets on which there is defined a particular system of operations. However up until the forties the overwhelming majority of algebraists were investigating merely a few kinds of algebraic structures. These were primarily groups, rings and lattices. The first general theoretical work dealing with arbitrary sets with arbitrary operations is due to G. Birkhoff (1935). During these same years, A. Tarski published an important paper in which he formulated the basic prin ciples of a theory of sets equipped

with a system of relations. Such sets are now called models. In contrast to algebra, model theory made abun dant use of the apparatus of mathematical logic. The possibility of making fruitful use of logic not only to study universal algebras but also the more classical parts of algebra such as group theory was dis covered by the author in 1936. During the next twenty-five years, it gradually became clear that the theory of universal algebras and model theory are very intimately related despite a certain difference in the nature of their problems. And it is therefore meaningful to speak of a single theory of algebraic systems dealing with sets on which there is defined a series of operations and relations (algebraic systems). The formal apparatus of the theory is the language of the so-called applied predicate calculus. Thus the theory can be considered to border on logic and algebra.

Finite Element Solution of Boundary Value Problems - O. Axelsson 2014-05-10

Finite Element Solution of Boundary Value Problems: Theory and Computation provides an introduction to both the theoretical and computational aspects of the finite element method for solving boundary value problems for partial differential equations. This book is composed of seven chapters and begins with surveys of the two kinds of preconditioning techniques, one based on the symmetric successive overrelaxation iterative method for solving a system of equations and a form of incomplete factorization. The subsequent chapters deal with the concepts from functional analysis of boundary value problems. These topics are followed by discussions of the Ritz method, which minimizes the quadratic functional associated with a given boundary value problem over some finite-dimensional subspace of the original space of functions. Other chapters are devoted to direct methods, including Gaussian elimination and related methods, for solving a system of linear algebraic equations. The final chapter continues the analysis of preconditioned conjugate gradient methods, concentrating on applications to finite element problems. This chapter also looks into the techniques for reducing rounding errors in the iterative solution of finite element equations. This book will be of value to advanced undergraduates and graduates in the areas of numerical analysis, mathematics, and computer science, as well as for theoretically inclined workers in engineering and the physical sciences.

Non-Homogeneous Boundary Value Problems and Applications - Jacques Louis Lions 2012-12-06

I. In this second volume, we continue at first the study of non homogeneous boundary value problems for particular classes of evolu tion equations. 1 In Chapter 4 , we study parabolic operators by the method of Agranovitch-Vishik [lJ; this is step (i) (Introduction to Volume I, Section 4), i.e. the study of regularity. The next steps: (ii) transposition, (iii) interpolation, are similar in principle to those of Chapter 2, but involve rather considerable additional technical difficulties. In Chapter 5, we study hyperbolic operators or operators well defined in thesense of Petrowski or Schroedinger. Our regularity results (step (i)) seem to be new. Steps (ii) and (iii) are all3.logous to those of the parabolic case, except for certain technical differences. In Chapter 6, the results of Chapter'> 4 and 5 are applied to the study of optimal control problems for systems governed by evolution equations, when the control appears in the boundary conditions (so that non-homogeneous boundary value problems are the basic tool of this theory). Another type of application, to the characterization of "all" well-posed problems for the operators in question, is given in the Ap pendix. Still other applications, for example to numerical analysis, will be given in Volume 3.

Elliptic Partial Differential Equations of Second Order - D. Gilbarg 2013-03-09

This volume is intended as an essentially self contained exposition of portions of the theory of second order quasilinear elliptic partial differential equations, with emphasis on the Dirichlet problem in bounded domains. It grew out of lecture notes for graduate courses by the authors at Stanford University, the final material extending well beyond the scope of these courses. By including preparatory chapters on topics such as potential theory and functional analysis, we have attempted to make the work accessible to a broad spectrum of readers. Above all, we hope the readers of this book will gain an appreciation of the multitude of ingenious barehanded techniques that have been developed in the study of elliptic equations and have become part of the repertoire of analysis. Many individuals have assisted us during the evolution of this work over the past several years. In particular, we are grateful for the valuable discussions with L. M. Simon and his contributions in Sections 15.4 to 15.8; for the helpful comments and corrections of J. M. Cross, A. S. Geue, J. Nash, P. Trudinger and B. Turkington; for the contributions of G. Williams in Section 10.5 and of A. S. Geue in Section 10.6; and for the impeccably typed manuscript which resulted from the dedicated efforts oflsolde Field at Stanford and Anna Zalucki at Canberra. The research of the authors connected with this volume was supported in part by the National Science Foundation.