Geometrical Methods In The Theory Of Ordinary Differential Equations Grundlehren Der Mathematischen Wissenschaften V 250

Selected Topics in the Geometrical Study of Differential Equations - Niky Kamran 2002-01-01

Geometric Inequalities - Yurii D. Burago 2013-03-14
A 1988 classic, covering Two-dimensional Surfaces; Domains on the Plane and on Surfaces; Brunn-Minkowski Inequality and Classical Isoperimetric Inequality; Isoperimetric Inequalities for Various Definitions of Area; and Inequalities Involving Mean Curvature.
Geometric Methods in System Theory - D.Q. Mayne 2012-06-01
Geometric Methods in System Theory In automatic control there are a large number of applications of a fairly simple type for which the motion of the state variables is not free to evolve in a vector space but rather must satisfy some constraints. Examples are numerous; in a switched, lossless electrical network energy is conserved and the state evolves on an ellipsoid surface defined by x'Qx equals a constant; in the control of finite state, continuous time, Markov processes the state evolves on the set x'x = 1, xi ~ O. The control of rigid body motions and trajectory control leads to problems of this type. There has been under way now for some time an effort to build up enough control theory to enable one to treat these problems in a more or less routine way. It is important to emphasise that the

ordinary vector space-linear theory often gives the wrong insight and thus should not be relied upon.

Quadratic and Hermitian Forms over Rings - Max-Albert Knus 2012-12-06

From its birth (in Babylon?) till 1936 the theory of quadratic forms dealt almost exclusively with forms over the real field, the complex field or the ring of integers. Only as late as 1937 were the foundations of a theory over an arbitrary field laid. This was in a famous paper by Ernst Witt. Still too early, apparently, because it took another 25 years for the ideas of Witt to be pursued, notably by Albrecht Pfister, and expanded into a full branch of algebra. Around 1960 the development of algebraic topology and algebraic K-theory led to the study of quadratic forms over commutative rings and hermitian forms over rings with involutions. Not surprisingly, in this more general setting, algebraic K-theory plays the role that linear algebra plays in the case of fields. This book exposes the theory of quadratic and hermitian forms over rings in a very general setting. It avoids, as far as possible, any restriction on the characteristic and takes full advantage of the functorial aspects of the theory. The advantage of doing so is not only aesthetical: on the one hand, some classical proofs gain in simplicity and transparency, the most notable examples being the results on low-dimensional spinor groups; on the other hand new results are obtained, which went unnoticed even for fields, as in the case of involutions on 16-dimensional central simple algebras. The first chapter gives an introduction to the basic definitions and properties of hermitian forms which are used throughout the book.

Geometrical Methods in the Theory of Ordinary Differential Equations - V.I. Arnold 2012-12-06

Since the first edition of this book, geometrical methods in the theory of ordinary differential equations have become very popular and some progress has been made partly with the help of computers. Much of this progress is represented in this revised, expanded edition, including such topics as the Feigenbaum universality of period doubling, the Zoladec solution, the Iljashenko proof, the Ecalle and Voronin theory, the Varchenko and Hovanski theorems, and the Neistadt theory. In the selection of material for this book, the author explains basic ideas and methods applicable to the study of differential equations. Special efforts were made to keep the basic ideas free from excessive technicalities. Thus the most fundamental questions are considered in great detail, while of the more special and difficult parts of the theory have the character of a survey. Consequently, the reader needs only a general mathematical knowledge to easily follow this text. It is directed to mathematicians, as well as all users of the theory of differential equations.

Geometrical Dynamics of Complex Systems - Vladimir G. Ivancevic 2006-09-10

Geometrical Dynamics of Complex Systems is a graduate?level monographic textbook. Itrepresentsacomprehensiveintroductionintorigorousgeometrical dynamicsofcomplexsystemsofvariousnatures. By?complexsystems?,inthis book are meant high?dimensional nonlinear systems, which can be (but not necessarily are) adaptive. This monograph proposes a uni?ed geometrical - proachtodynamicsofcomplexsystemsofvariouskinds:engineering,physical, biophysical, psychophysical, sociophysical, econophysical, etc. As their names suggest, all these multi?input multi?output (MIMO) systems have something in common: the underlying physics. However, instead of dealing with the pop- 1 ular ?soft complexity philosophy?, we rather propose a rigorous geometrical and topological approach. We believe that our rigorous approach has much greater predictive power than the soft one. We argue that science and te- nology is all about prediction and control. Observation, understanding and explanation are important in education at undergraduate level, but after that it should be all prediction and control. The main objective of this book is to show that high?dimensional nonlinear systems and processes of ?real life? can be modelled and analyzed using rigorous mathematics, which enables their complete predictability and controllability, as if they were linear systems. It is well?known that linear systems, which are completely predictable and controllable by de?nition ? live only in Euclidean spaces (of various - mensions). They are as simple as possible, mathematically elegant and fully elaborated from either scienti?c or engineering side. However, in nature, no- ing is linear. In reality, everything has a certain degree of nonlinearity, which means: unpredictability, with subsequent uncontrollability.

Diophantine Approximation on Linear Algebraic Groups - Michel Waldschmidt 2013-03-14

The theory of transcendental numbers is closely related to the study of diophantine approximation. This book deals with values of the usual exponential function ez: a central open problem is the conjecture on algebraic independence of logarithms of algebraic numbers. Two chapters provide complete and simplified proofs of zero estimates (due to Philippon) on linear algebraic groups.

Geometric Configurations of Singularities of Planar Polynomial Differential Systems - Joan C. Artés 2021-07-19

This book addresses the global study of finite and infinite singularities of planar polynomial differential systems, with special emphasis on quadratic systems. While results covering the degenerate cases of singularities of quadratic systems have been published elsewhere, the proofs for the remaining harder cases were lengthier. This book covers all cases, with half of the content focusing on the last non-degenerate ones. The book contains the complete bifurcation diagram, in the 12-parameter space, of global geometrical configurations of singularities of quadratic systems. The authors’ results provide - for the first time - global information on all singularities of quadratic systems in invariant form and their bifurcations. In addition, a link to a very helpful software package is included. With the help of this software, the study of the algebraic bifurcations becomes much more efficient and less time-consuming. Given its scope, the book will appeal to specialists on polynomial differential systems, pure and applied mathematicians who need to study bifurcation diagrams of families of such systems, Ph.D. students, and postdoctoral fellows.

Mathematical Physics I - Matteo Petrera 2013-12-10

These Lecture Notes provide an introduction to the theory of finite-dimensional dynamical systems. The first part presents the main classical results about continuous time dynamical systems with a finite number of degrees of freedom. Among the topics covered are: initial value problems, geometrical methods in the theory of ordinary differential equations, stability theory, aspects of local bifurcation theory. The second part is devoted to the Lagrangian and Hamiltonian formulation of finite-dimensional dynamical systems, both on Euclidean spaces and smooth manifolds. The main topics are: variational formulation of Newtonian mechanics, canonical Hamiltonian mechanics, theory of canonical transformations, introduction to mechanics on Poisson and symplectic manifolds. The material is presented in a way that is at once intuitive, systematic and mathematically rigorous. The theoretical part is supplemented with many concrete examples and exercises.

Stochastic Interacting Systems: Contact, Voter and Exclusion Processes - Thomas M. Liggett 2013-03-09

Interactive particle systems is a branch of probability theory with close connections to mathematical physics and mathematical biology. This book takes three of the most important models in the area, and traces advances in our understanding of them since 1985. It explains and develops many of the most useful techniques in the field.

Geometrical Methods in the Theory of Ordinary Differential Equations - Vladimir I Arnol'd 1988

Metric Spaces of Non-Positive Curvature - Martin R. Bridson 2013-03-09

A description of the global properties of simply-connected spaces that are non-positively curved in the sense of A. D. Alexandrov, and the structure of groups which act on such spaces by isometries. The theory of these objects is developed in a manner accessible to anyone familiar with the rudiments of topology and group theory: non-trivial theorems are proved by concatenating elementary geometric arguments, and many examples are given. Part I provides an introduction to the geometry of geodesic spaces, while Part II develops the basic theory of spaces with upper curvature bounds. More specialized topics, such as complexes of groups, are covered in Part III.

Perturbations - James A. Murdock 1999-01-01

Perturbations: Theory and Methods gives a thorough introduction to both regular and singular perturbation methods for algebraic and differential equations. Unlike most introductory books on the subject, this one distinguishes between formal and rigorous asymptotic validity, which are commonly confused in books that treat perturbation theory as a bag of heuristic tricks with no foundation. The meaning of "uniformity" is carefully explained in a variety of contexts. All standard methods, such as rescaling, multiple scales, averaging, matching, and the WKB method are covered, and the asymptotic validity (in the rigorous sense) of each method is carefully proved. First published in 1991, this book is still useful today because it is an introduction. It combines perturbation results with those known through other methods. Sometimes a geometrical result (such as the existence of a periodic solution) is rigorously deduced from a perturbation result, and at other times a knowledge of the geometry of the solutions is used to aid in the selection of an effective perturbation method. Dr. Murdock's approach differs from other introductory texts because he attempts to present perturbation theory as a natural part of a larger whole, the mathematical theory of differential equations. He explores the meaning of the results and their connections to other ways of studying the same problems.

Modern Geometry - Methods and Applications - B.A. Dubrovin 2013-03-14

manifolds, transformation groups, and Lie algebras, as well as the basic concepts of visual topology. It was also agreed that the course should be given in as simple and concrete a language as possible, and that wherever practic able the terminology should be that used by physicists. Thus it was along these lines that the archetypal course was taught. It was given more permanent form as duplicated lecture notes published under the auspices of Moscow State University as: Differential Geometry, Parts I and II, by S. P. Novikov, Division of Mechanics, Moscow State University, 1972. Subsequently various parts of the course were altered, and new topics added. This supplementary material was published (also in duplicated form) as Differential Geometry, Part III, by S. P. Novikov and A. T. Fomenko, Division of Mechanics, Moscow State University, 1974. The present book is the outcome of a reworking, re-ordering, and ex tensive elaboration of the above-mentioned lecture notes. It is the authors' view that it will serve as a basic text from which the essentials for a course in modern geometry may be easily extracted. To S. P. Novikov are due the original conception and the overall plan of the book. The work of organizing the material contained in the duplicated lecture notes in accordance with this plan was carried out by B. A. Dubrovin.

Geometrical Methods in the Theory of Ordinary Differential Equations - V.I. Arnold 1988

Since 1978, when the first Russian edition of this book appeared, geometrical methods in the theory of ordinary differential equations have become very popular. A lot of computer experiments have been performed and some theorems have been proved. In this edition, this progress is (partially) repre sented by some additions to the first English text. I mention here some of these recent discoveries. I. The Feigenbaum universality of period doubling cascades and its extensions- the renormalization group analysis of bifurcations (Percival, Landford, Sinai, ...). 2. The Zol~dek solution of the two-parameter bifurcation problem (cases of two imaginary pairs of eigenvalues and of a zero eigenvalue and a pair). 3. The Iljashenko proof of the "Dulac theorem" on the finiteness of the number of limit cycles of polynomial planar vector fields. 4. The Ecalle and Voronin theory of hoi om orphic invariants for formally equivalent dynamical systems at resonances. 5. The Varchenko and Hovanski theorems on the finiteness of the number of limit cycles generated by a polynomial perturbation of a poly nomial Hamiltonian system (the Dulac form of the weakened version of Hilbert's sixteenth problem). 6. The Petrov estimates of the number of zeros of the elliptic integrals responsible for the birth of limit cycles for polynomial perturbations 2 of the Hamiltonian system x = x - I (solution of the weakened sixteenth Hilbert problem for cubic Hamiltonians). 7. The Bachtin theorems on averaging in systems with several frequencies.

Laminations and Foliations in Dynamics, Geometry and Topology - Mikhail Lyubich 2001

This volume is based on a conference held at SUNY, Stony Brook (NY). The concepts of laminations and foliations appear in a diverse number of fields, such as topology, geometry, analytic differential equations, holomorphic dynamics, and renormalization theory. Although these areas have developed deep relations, each has developed distinct research fields with little interaction among practitioners. The conference brought together the diverse points of view of researchers from different areas. This book includes surveys and research papers reflecting the broad spectrum of themes presented at the event. Of particular interest are the articles by F. Bonahon, ``Geodesic Laminations on Surfaces'', and D. Gabai, ``Three Lectures on Foliations and Laminations on 3-manifolds'', which are based on minicourses that took place during the conference.

Computer Algebra in Scientific Computing - Vladimir P. Gerdt 2013-08-15

This book constitutes the proceedings of the 14th International Workshop on Computer Algebra in Scientific Computing, CASC 2013, held in Berlin, Germany, in September 2013. The 33 full papers presented were carefully reviewed and selected for inclusion in this book. The papers address issues such as polynomial algebra; the solution of tropical linear systems and tropical polynomial systems; the theory of matrices; the use of computer algebra for the investigation of various mathematical and applied topics related to ordinary differential equations (ODEs); applications of symbolic computations for solving partial differential equations (PDEs) in mathematical physics; problems arising at the application of computer algebra methods for finding infinitesimal symmetries; applications of symbolic and symbolic-numeric algorithms in mechanics and physics; automatic differentiation; the application of the CAS Mathematica for the simulation of quantum error correction in quantum computing; the application of the CAS GAP for the enumeration of Schur rings over the group A5; constructive computation of zero separation bounds for arithmetic expressions; the parallel implementation of fast Fourier transforms with the aid of the Spiral library generation system; the use of object-oriented languages such as Java or Scala for implementation of categories as type classes; a survey of industrial applications of approximate computer algebra.

Applied Differential Geometry - Vladimir G. Ivancevic 2007

Introduction -- Technical preliminaries: tensors, actions and functors -- Applied manifold geometry -- Applied bundle geometry -- Applied jet geometry -- Geometrical path integrals and their applications

Matrix Methods: Theory, Algorithms and Applications -

Quantum Field Theory II: Quantum Electrodynamics - Eberhard Zeidler 2008-09-03

And God said, Let there be light; and there was light. Genesis 1,3 Light is not only the basis of our biological existence, but also an essential source of our knowledge about the physical laws of nature, ranging from the seventeenth century geometrical optics up to the twentieth century theory of general relativity and quantum electrodynamics. Folklore Don’t give us numbers: give us insight! A contemporary natural scientist to a mathematician The present book is the second volume of a comprehensive introduction to themathematicalandphysicalaspectsofmodernquantum?eldtheorywhich comprehends the following six volumes: Volume I: Basics in Mathematics and Physics Volume II: Quantum Electrodynamics Volume III: Gauge Theory Volume IV: Quantum Mathematics Volume V: The Physics of the Standard Model Volume VI: Quantum Gravitation and String Theory. It is our goal to build a bridge between mathematicians and physicists based on the challenging question about the fundamental forces in • macrocosmos (the universe) and • microcosmos (the world of elementary particles). The six volumes address a broad audience of readers, including both und- graduate and graduate students, as well as experienced scientists who want to become familiar with quantum ?eld theory, which is a fascinating topic in modern mathematics and physics.

Convex and Discrete Geometry - Peter M. Gruber 2007-05-17

Convex and Discrete Geometry is an area of mathematics situated between analysis, geometry and discrete mathematics with numerous relations to other subdisciplines. This book provides a comprehensive overview of major results, methods and ideas of convex and discrete geometry and its applications. Besides being a graduate-level introduction to the field, it is a practical source of information and orientation for convex geometers, and useful to people working in the applied fields.

The Geometry of Infinite-Dimensional Groups - Boris Khesin 2008-09-28

This monograph gives an overview of various classes of infinite-dimensional Lie groups and their applications in Hamiltonian mechanics, fluid dynamics, integrable systems, gauge theory, and complex geometry. The text includes many exercises and open questions.

Geometrical Methods in the Theory of Ordinary Differential Equations - Vladimir I Arnol'd 1983-03-28

The expanded second edition of this book reflects new developments including the Feigenbaum universality of period doubling, the Zoladec solution, the Iljashenko proof, the Ecalle and Voronin theory, the Varchenko and Hovanski theorems and the Neistadt theory.

Modern Geometric Structures and Fields - Сергей Петрович Новиков 2006-01

The book presents the basics of Riemannian geometry in its modern form as geometry of differentiable manifolds and the most important structures on them. The authors' approach is that the source of all constructions in Riemannian geometry is a manifold that allows one to compute scalar products of tangent vectors. With this approach, the authors show that Riemannian geometry has a great influence to several fundamental areas of modern mathematics and its applications. In particular, Geometry is a bridge between pure mathematics and natural sciences, first of all physics. Fundamental laws of nature are formulated as relations between geometric fields describing various physical quantities. The study of global properties of geometric objects leads to the far-reaching development of topology, including topology and geometry of fiber bundles. Geometric theory of Hamiltonian systems, which describe many physical phenomena, led to the development of symplectic and Poisson geometry. Field theory and the multidimensional calculus of variations, presented in the book, unify mathematics with theoretical physics. Geometry of complex and algebraic manifolds unifies Riemannian geometry with modern complex analysis, as well as with algebra and number theory. Prerequisites for using the book include several basic undergraduate courses, such as advanced calculus, linear algebra, ordinary differential equations, and elements of topology.

Classical Mechanics - Joseph L. McCauley 1997-05-08

This advanced text is the first book to describe the subject of classical mechanics in the context of the language and methods of modern nonlinear dynamics. The organizing principle of the text is integrability vs. nonintegrability.

Mathematical Methods of Classical Mechanics - V.I. Arnol'd 1997-09-05

This book constructs the mathematical apparatus of classical mechanics from the beginning, examining basic problems in dynamics like the theory of oscillations and the Hamiltonian formalism. The author emphasizes geometrical considerations and includes phase spaces and flows, vector fields, and Lie groups. Discussion includes qualitative methods of the theory of dynamical systems and of asymptotic methods like averaging and adiabatic invariance.

Applications of Contact Geometry and Topology in Physics - Arkady Leonidovich Kholodenko 2013

Although contact geometry and topology is briefly discussed in V I Arnol''d''s book Mathematical Methods of Classical Mechanics (Springer-Verlag, 1989, 2nd edition), it still remains a domain of research in pure mathematics, e.g. see the recent monograph by H Geiges An Introduction to Contact Topology (Cambridge U Press, 2008). Some attempts to use contact geometry in physics were made in the monograph Contact Geometry and Nonlinear Differential Equations (Cambridge U Press, 2007). Unfortunately, even the excellent style of this monograph is not sufficient to attract the attention of the physics community to this type of problems. This book is the first serious attempt to change the existing status quo. In it we demonstrate that, in fact, all branches of theoretical physics can be rewritten in the language of contact geometry and topology: from mechanics, thermodynamics and electrodynamics to optics, gauge fields and gravity; from physics of liquid crystals to quantum mechanics and quantum computers, etc. The book is written in the style of famous Landau-Lifshitz (L-L) multivolume course in theoretical physics. This means that its readers are expected to have solid background in theoretical physics (at least at the level of the L-L course). No prior knowledge of specialized mathematics is required. All needed new mathematics is given in the context of discussed physical problems. As in the L-L course some problems/exercises are formulated along the way and, again as in the L-L course, these are always supplemented by either solutions or by hints (with exact references). Unlike the L-L course, though, some definitions, theorems, and remarks are also presented. This is done with the purpose of stimulating the interest of our readers in deeper study of subject matters discussed in the text.

Nonlinear Ordinary Differential Equations - R. Grimshaw 2017-10-19

Ordinary differential equations have long been an important area of study because of their wide application in physics, engineering, biology, chemistry, ecology, and economics. Based on a series of lectures given at the Universities of Melbourne and New South Wales in Australia, Nonlinear Ordinary Differential Equations takes the reader from basic elementary notions to the point where the exciting and fascinating developments in the theory of nonlinear differential equations can be understood and appreciated. Each chapter is self-contained, and includes a selection of problems together with some detailed workings within the main text. Nonlinear Ordinary Differential Equations helps develop an understanding of the subtle and sometimes unexpected properties of nonlinear systems and simultaneously introduces practical analytical techniques to analyze nonlinear phenomena. This excellent book gives a structured, systematic, and rigorous development of the basic theory from elementary concepts to a point where readers can utilize ideas in nonlinear differential equations.

Ordinary Differential Equations - Vladimir I. Arnold

1992-05-08
Few books on Ordinary Differential Equations (ODEs) have the elegant geometric insight of this one, which puts emphasis on the qualitative and geometric properties of ODEs and their solutions, rather than on routine presentation of algorithms. From the reviews: "Professor Arnold has expanded his classic book to include new material on exponential growth, predator-prey, the pendulum, impulse response, symmetry groups and group actions, perturbation and bifurcation." --SIAM REVIEW

Geometric Methods in System Theory - D.Q. Mayne 1973-12-31
Geometric Methods in System Theory In automatic control there are a large number of applications of a fairly simple type for which the motion of the state variables is not free to evolve in a vector space but rather must satisfy some constraints. Examples are numerous; in a switched, lossless electrical network energy is conserved and the state evolves on an ellipsoid surface defined by x'Qx equals a constant; in the control of finite state, continuous time, Markov processes the state evolves on the set x'x = 1, xi ~ O. The control of rigid body motions and trajectory control leads to problems of this type. There has been under way now for some time an effort to build up enough control theory to enable one to treat these problems in a more or less routine way. It is important to emphasise that the ordinary vector space-linear theory often gives the wrong insight and thus should not be relied upon.

Hyperbolic Conservation Laws in Continuum Physics - Constantine M. Dafermos 2013-06-29
This masterly exposition of the mathematical theory of hyperbolic system laws brings out the intimate connection with continuum thermodynamics, emphasizing issues in which the analysis may reveal something about the physics and, in return, the underlying physical structure may direct and drive the analysis.

Limit Theorems for Stochastic Processes - Jean Jacod 2013-03-09
This volume by two international leaders in the field proposes a systematic exposition of convergence in law for stochastic processes from the point of view of semimartingale theory. It emphasizes results that are useful for mathematical theory and mathematical statistics. Coverage develops in detail useful parts of the general theory of stochastic processes, such as martingale problems and absolute continuity or contiguity results.

Continuous Martingales and Brownian Motion - Daniel Revuz 2013-06-29
This book focuses on the probabilistic theory ofBrownian motion. This is a good topic to center a discussion around because Brownian motion is in the intersec tioll of many fundamental classes of processes. It is a continuous martingale, a Gaussian process, a Markov process or more specifically a process with in dependent increments; it can actually be defined, up to simple transformations, as the real-valued, centered process with independent increments and continuous paths. It is therefore no surprise that a vast array of techniques may be success fully applied to its study and we, consequently, chose to organize the book in the following way. After a first chapter where Brownian motion is introduced, each of the following ones is devoted to a new technique or notion and to some of its applications to Brownian motion. Among these techniques, two are of para mount importance: stochastic calculus, the use ofwhich pervades the whole book and the powerful

excursion theory, both of which are introduced in a self contained fashion and with a minimum of apparatus. They have made much easier the proofs of many results found in the epoch-making book of Itö and McKean: Diffusion Processes and their Sampie Paths, Springer (1965).

The Parameterization Method for Invariant Manifolds - Àlex Haro 2016-04-18

This monograph presents some theoretical and computational aspects of the parameterization method for invariant manifolds, focusing on the following contexts: invariant manifolds associated with fixed points, invariant tori in quasi-periodically forced systems, invariant tori in Hamiltonian systems and normally hyperbolic invariant manifolds. This book provides algorithms of computation and some practical details of their implementation. The methodology is illustrated with 12 detailed examples, many of them well known in the literature of numerical computation in dynamical systems. A public version of the software used for some of the examples is available online. The book is aimed at mathematicians, scientists and engineers interested in the theory and applications of computational dynamical systems.

The Method of Normal Forms - Ali H. Nayfeh 2011-08-24

In this introductory treatment Ali Nayfeh presents different concepts from dynamical systems theory and nonlinear dynamics in a rigorous yet plan way. He systematically introduces models and techniques and states the relevant ranges of validity and applicability. The reader is provided with a clear operational framework for consciously use rather than focused on the underlying mathematical apparatus. The exposition is largely by means of examples, dealt with up to their final outcome. For most of the examples, the results obtained with the method of normal forms are equivalent to those obtained with other perturbation methods, such as the method of multiple scales and the method of averaging. The previous edition had a remarkable success by researchers from all over the world working in the area of nonlinear dynamics and their applications in engineering. Additions to this new edition concern major topics of current interest. In particular, the author added three new chapters dedicated to Maps, Bifurcations of Continuous Systems, and Retarded Systems. In particular the latter has become of major importance in several applications, both in mechanics and in different areas. Accessible to engineers and applied scientist involved with nonlinear dynamics and their applications in a wide variety of fields. It is assumed that readers have a knowledge of basic calculus as well as the elementary properties of ordinary-differential equations.

From Brownian Motion to Schrödinger’s Equation - Kai L. Chung 2012-12-06

In recent years, the study of the theory of Brownian motion has become a powerful tool in the solution of problems in mathematical physics. This self-contained and readable exposition by leading authors, provides a rigorous account of the subject, emphasizing the "explicit" rather than the "concise" where necessary, and addressed to readers interested in probability theory as applied to analysis and mathematical physics. A distinctive feature of the methods used is the ubiquitous appearance of stopping time. The book contains much original research by the authors (some of which published here for the first time) as well as detailed and improved versions of relevant important results by other authors, not easily accessible in existing literature.

Phase Space Analysis of Partial Differential Equations - Antonio Bove 2007-12-28

Covers phase space analysis methods, including microlocal analysis, and their applications to physics Treats the linear and nonlinear aspects of the theory of PDEs Original articles are self-contained with full proofs; survey articles give a quick and direct introduction to selected topics evolving at a fast pace Excellent reference and resource for grad students and researchers in PDEs and related fields

Geometry of Algebraic Curves - Enrico Arbarello 2013-11-11

In recent years there has been enormous activity in the theory of algebraic curves. Many long-standing problems have been solved using the general techniques developed in algebraic geometry during the 1950's and 1960's. Additionally, unexpected and deep connections between algebraic curves and differential equations have been uncovered, and these in turn shed light on other classical problems in curve theory. It seems fair to say that the theory of algebraic curves looks completely different now from how it appeared 15 years ago; in particular, our current state of knowledge repre sents a significant advance beyond the legacy left by the classical geometers such as Noether, Castelnuovo, Enriques, and Severi. These books give a presentation of one of the central areas of this recent activity; namely, the study of linear series on both a fixed curve (Volume I) and on a variable curve (Volume II). Our goal is to give a comprehensive and self-contained account of the extrinsic geometry of algebraic curves, which in our opinion constitutes the main geometric core of the recent advances in curve theory. Along the way we shall, of course, discuss appli cations of the theory of linear series to a number of classical topics (e.g., the geometry of the Riemann theta divisor) as well as to some of the current research (e.g., the Kodaira dimension of the moduli space of curves).

Control Theory from the Geometric Viewpoint - Andrei A. Agrachev 2013-03-14

This book presents some facts and methods of the Mathematical Control Theory treated from the geometric point of view. The book is mainly based on graduate courses given by the first coauthor in the years 2000-2001 at the International School for Advanced Studies, Trieste, Italy. Mathematical prerequisites are reduced to standard courses of Analysis and Linear Algebra plus some basic Real and Functional Analysis. No preliminary knowledge of Control Theory or Differential Geometry is required. What this book is about? The classical deterministic physical world is described by smooth dynamical systems: the future in such a system is com pletely determined by the initial conditions. Moreover, the near future changes smoothly with the initial data. If we leave room for "free will" in this fatalistic world, then we come to control systems. We do so by allowing certain param eters of the dynamical system to change freely at every instant of time. That is what we routinely do in real life with our body, car, cooker, as well as with aircraft, technological processes etc. We try to control all these dynamical systems! Smooth dynamical systems are governed by differential equations. In this book we deal only with finite dimensional systems: they are governed by ordi nary differential equations on finite dimensional smooth manifolds. A control system for us is thus a family of ordinary differential equations. The family is parametrized by control parameters.

The Geometric Theory of Ordinary Differential Equations and Algebraic Functions - Georges Valiron 1984