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Analysis, Manifolds and Physics, Part II - Revised and Enlarged Edition Y. Choquet-Bruhat 2000-11-08 Twelve problems have been added to the first edition; four of them are supplements to problems in the first edition. The others deal with issues that have become important, since the first edition of Volume II, in recent developments of various areas of physics. All the problems have their foundations in volume 1 of the 2-Volume set Analysis, Manifolds and Physics. It would have been prohibitively expensive to insert the new problems at their respective places. They are grouped together at the end of this volume, their logical place is indicated by a number of parenthesis following the title.
Differential Geometry and Mathematical Physics Gerd Rudolph 2012-11-09 Starting from an undergraduate level, this book systematically develops the basics of • Calculus on manifolds, vector bundles, vector fields and differential forms, • Lie groups and Lie group actions, • Linear symplectic algebra and symplectic geometry, • Hamiltonian systems, symmetries and reduction, integrable systems and Hamilton-Jacobi theory. The topics listed under the first item are relevant for virtually all areas of mathematical physics. The second and third items constitute the link between abstract calculus and the theory of Hamiltonian systems. The last item provides an introduction to various aspects of this theory, including Morse families, the Maslov class and caustics. The book guides the reader from elementary differential geometry to advanced topics in the theory of Hamiltonian systems with the aim of making current research literature accessible. The style is that of a mathematical textbook,with full proofs given in the text or as exercises. The material is illustrated by numerous detailed examples, some of which are taken up several times for demonstrating how the methods evolve and interact.
Image Structure Luc Florack 2013-04-17 Despite the fact that images constitute the main objects in computer vision and image analysis, there is remarkably little concern about their actual definition. In this book a complete account of image structure is proposed in terms of rigorously defined machine concepts, using basic tools from algebra, analysis, and differential geometry. Machine technicalities such as discretisation and quantisation details are de-emphasised, and robustness with respect to noise is manifest. From the foreword by Jan Koenderink: `It is my hope that the book will find a wide audience, including physicists - who still are largely unaware of the general importance and power of scale space theory, mathematicians - who will find in it a principled and formally tight exposition of a topic awaiting further development, and computer scientists - who will find here a unified and conceptually well founded framework for many apparently unrelated and largely historically motivated methods they already know and love. The book is suited for self-study and graduate courses, the carefully formulated exercises are designed to get to grips with the subject matter and prepare the reader for original research.'
Fundamentals of Tensor Calculus for Engineers with a Primer on Smooth Manifolds Uwe Mühlich 2017-04-18 This book presents the fundamentals of modern tensor calculus for students in engineering and applied physics, emphasizing those aspects that are crucial for applying tensor calculus safely in Euclidian space and for grasping the very essence of the smooth manifold concept. After introducing the subject, it provides a brief exposition on point set topology to familiarize readers with the subject, especially with those topics required in later chapters. It then describes the finite dimensional real vector space and its dual, focusing on the usefulness of the latter for encoding duality concepts in physics. Moreover, it introduces tensors as objects that encode linear mappings and discusses affine and Euclidean spaces. Tensor analysis is explored first in Euclidean space, starting from a generalization of the concept of differentiability and proceeding towards concepts such as directional derivative, covariant derivative and integration based on differential forms. The final chapter addresses the role of smooth manifolds in modeling spaces other than Euclidean space, particularly the concepts of smooth atlas and tangent space, which are crucial to understanding the topic. Two of the most important concepts, namely the tangent bundle and the Lie derivative, are subsequently worked out.
Physical (A)Causality Karl Svozil 2018-02-13 This book is open access under a CC BY 4.0 license. This book addresses the physical phenomenon of events that seem to occur spontaneously and without any known cause. These are to be contrasted with events that happen in a (pre-)determined, predictable, lawful, and causal way. All our knowledge is based on self-reflexive theorizing, as well as on operational means of empirical perception. Some of the questions that arise are the following: are these limitations reflected by our models? Under what circumstances does chance kick in? Is chance in physics merely epistemic? In other words, do we simply not know enough, or use too crude levels of description for our predictions? Or are certain events "truly", that is, irreducibly, random? The book tries to answer some of these questions by introducing intrinsic, embedded observers and provable unknowns; that is, observables and procedures which are certified (relative to the assumptions) to be unknowable or undoable. A (somewhat iconoclastic) review of quantum mechanics is presented which is inspired by quantum logic. Postulated quantum (un-)knowables are reviewed. More exotic unknowns originate in the assumption of classical continua, and in finite automata and generalized urn models, which mimic complementarity and yet maintain value definiteness. Traditional conceptions of free will, miracles and dualistic interfaces are based on gaps in an otherwise deterministic universe.
Global and Stochastic Analysis with Applications to Mathematical Physics Yuri E. Gliklikh 2010-12-07 Methods of global analysis and stochastic analysis are most often applied in mathematical physics as separate entities, thus forming important directions in the field. However, while combination of the two subject areas is rare, it is fundamental for the consideration of a broader class of problems. This book develops methods of Global Analysis and Stochastic Analysis such that their combination allows one to have a more or less common treatment for areas of mathematical physics that traditionally are considered as divergent and requiring different methods of investigation. Global and Stochastic Analysis with Applications to Mathematical Physics covers branches of mathematics that are currently absent in monograph form. Through the demonstration of new topics of investigation and results, both in traditional and more recent problems, this book offers a fresh perspective on ordinary and stochastic differential equations and inclusions (in particular, given in terms of Nelson's mean derivatives) on linear spaces and manifolds. Topics covered include classical mechanics on non-linear configuration spaces, problems of statistical and quantum physics, and hydrodynamics. A self-contained book that provides a large amount of preliminary material and recent results which will serve to be a useful introduction to the subject and a valuable resource for further research. It will appeal to researchers, graduate and PhD students working in global analysis, stochastic analysis and mathematical physics.
Physics letters : [part B]. 1995
Electromagnetic Theory for Electromagnetic Compatibility Engineers Tze-Chuen Toh 2016-04-19 Engineers and scientists who develop and install electronic devices and circuits need to have a solid understanding of electromagnetic theory and the electromagnetic behavior of devices and circuits. In particular, they must be well-versed in electromagnetic compatibility, which minimizes and controls the side effects of interconnected electric dev
Modern Group Analysis: Advanced Analytical and Computational Methods in Mathematical Physics N.H. Ibragimov 2011-06-27 On the occasion of the 150th anniversary of Sophus Lie, an International Work shop "Modern Group Analysis: advanced analytical and computational methods in mathematical physics" has been organized in Acireale (Catania, Sicily, October 27 31, 1992). The Workshop was aimed to enlighten the present state ofthis rapidly expanding branch of applied mathematics. Main topics of the Conference were: • classical Lie groups applied for constructing invariant solutions and conservation laws; • conditional (partial) symmetries; • Backlund transformations; • approximate symmetries; • group analysis of finite-difference equations; • problems of group classification; • software packages in group analysis. The success of the Workshop was due to the participation of many experts in Group Analysis from different countries. This book consists of selected papers presented at the Workshop. We would like to thank the Scientific Committee for the generous support of recommending invited lectures and selecting the papers for this volume, as well as the members of the Organizing Committee for their help. The Workshop was made possible by the financial support of several sponsors that are listed below. It is also a pleasure to thank our colleague Enrico Gregorio for his invaluable help of this volume.
Transactions on Engineering Technologies Gi-Chul Yang 2015-05-07 This volume contains fifty-one revised and extended research articles written by prominent researchers participating in the international conference on Advances in Engineering Technologies and Physical Science (London, UK, 2-4 July, 2014), under the World Congress on Engineering 2014 (WCE 2014). Topics covered include mechanical engineering, bioengineering, internet engineering, wireless networks, image engineering, manufacturing engineering and industrial applications. The book offers an overview of the tremendous advances made recently in engineering technologies and the physical sciences and their applications and also serves as an excellent reference for researchers and graduate students working in these fields.
Numerical Analysis and Its Applications Ivan Dimov 2017-04-11 This book constitutes thoroughly revised selected papers of the 6th International Conference on Numerical Analysis and Its Applications, NAA 2016, held in Lozenetz, Bulgaria, in June 2016. The 90 revised papers presented were carefully reviewed and selected from 98 submissions. The conference offers a wide range of the following topics: Numerical Modeling; Numerical Stochastics; Numerical Approx-imation and Computational Geometry; Numerical Linear Algebra and Numer-ical Solution of Transcendental Equations; Numerical Methods for Differential Equations; High Performance Scientific Computing; and also special topics such as Novel methods in computational finance based on the FP7 Marie Curie Action,Project Multi-ITN STRIKE - Novel Methods in Compu-tational Finance, Grant Agreement Number 304617; Advanced numerical and applied studies of fractional differential equations.
Functional Integration Pierre Cartier 2006-11-30 Functional integration successfully entered physics as path integrals in the 1942 PhD dissertation of Richard P. Feynman, but it made no sense at all as a mathematical definition. Cartier and DeWitt-Morette have created, in this book, a fresh approach to functional integration. The book is self-contained: mathematical ideas are introduced, developed, generalised and applied. In the authors' hands, functional integration is shown to be a robust, user-friendly and multi-purpose tool that can be applied to a great variety of situations, for example: systems of indistinguishable particles; Aharonov-Bohm systems; supersymmetry; non-gaussian integrals. Problems in quantum field theory are also considered. In the final part the authors outline topics that can be profitably pursued using material already presented.
Linear Algebra And Optimization With Applications To Machine Learning - Volume Ii: Fundamentals Of Optimization Theory With Applications To Machine Learning Quaintance Jocelyn 2020-03-16 Volume 2 applies the linear algebra concepts presented in Volume 1 to optimization problems which frequently occur throughout machine learning. This book blends theory with practice by not only carefully discussing the mathematical under pinnings of each optimization technique but by applying these techniques to linear programming, support vector machines (SVM), principal component analysis (PCA), and ridge regression. Volume 2 begins by discussing preliminary concepts of optimization theory such as metric spaces, derivatives, and the Lagrange multiplier technique for finding extrema of real valued functions. The focus then shifts to the special case of optimizing a linear function over a region determined by affine constraints, namely linear programming. Highlights include careful derivations and applications of the simplex algorithm, the dual-simplex algorithm, and the primal-dual algorithm. The theoretical heart of this book is the mathematically rigorous presentation of various nonlinear optimization methods, including but not limited to gradient decent, the Karush-Kuhn-Tucker (KKT) conditions, Lagrangian duality, alternating direction method of multipliers (ADMM), and the kernel method. These methods are carefully applied to hard margin SVM, soft margin SVM, kernel PCA, ridge regression, lasso regression, and elastic-net regression. Matlab programs implementing these methods are included.
Quantum Field Theory I: Basics in Mathematics and Physics Eberhard Zeidler 2007-04-18 This is the first volume of a modern introduction to quantum field theory which addresses both mathematicians and physicists, at levels ranging from advanced undergraduate students to professional scientists. The book bridges the acknowledged gap between the different languages used by mathematicians and physicists. For students of mathematics the author shows that detailed knowledge of the physical background helps to motivate the mathematical subjects and to discover interesting interrelationships between quite different mathematical topics. For students of physics, fairly advanced mathematics is presented, which goes beyond the usual curriculum in physics.
The Structures of Mathematical Physics Steven P. Starkovich 2021 This textbook serves as an introduction to groups, rings, fields, vector and tensor spaces, algebras, topological spaces, differentiable manifolds and Lie groups --- mathematical structures which are foundational to modern theoretical physics. It is aimed primarily at undergraduate students in physics and mathematics with no previous background in these topics. Applications to physics --- such as the metric tensor of special relativity, the symplectic structures associated with Hamilton's equations and the Generalized Stokes's Theorem --- appear at appropriate places in the text. Worked examples, end-of-chapter problems (many with hints and some with answers) and guides to further reading make this an excellent book for self-study. Upon completing this book the reader will be well prepared to delve more deeply into advanced texts and specialized monographs in theoretical physics or mathematics.
Biologically Motivated Computer Vision Seong-Whang Lee 2003-07-31 It is our great pleasure and honor to organize the First IEEE Computer Society International Workshop on Biologically Motivated Computer Vision (BMCV 2000). The workshop BMCV 2000 aims to facilitate debates on biologically motivated vision systems and to provide an opportunity for researchers in the area of vision to see and share the latest developments in state-of-the-art technology. The rapid progress being made in the field of computer vision has had a tremendous impact on the modeling and implementation of biologically motivated computer vision. A multitude of new advances and findings in the domain of computer vision will be presented at this workshop. By December 1999 a total of 90 full papers had been submitted from 28 countries. To ensure the high quality of workshop and proceedings, the program committee selected and accepted 56 of them after a thorough review process. Of these papers 25 will be presented in 5 oral sessions and 31 in a poster session. The papers span a variety of topics in computer vision from computational theories to their implementation. In addition to these excellent presentations, there will be eight invited lectures by distinguished scientists on “hot” topics. We must add that the program committee and the reviewers did an excellent job within a tight schedule.

Basic Analysis V James K. Peterson 2021-08-20 Basic Analysis V: Functional Analysis and Topology introduces graduate students in science to concepts from topology and functional analysis, both linear and nonlinear. It is the fifth book in a series designed to train interested readers how to think properly using mathematical abstractions, and how to use the tools of mathematical analysis in applications. It is important to realize that the most difficult part of applying mathematical reasoning to a new problem domain is choosing the underlying mathematical framework to use on the problem. Once that choice is made, we have many tools we can use to solve the problem. However, a different choice would open up avenues of analysis from a different, perhaps more productive, perspective. In this volume, the nature of these critical choices is discussed using applications involving the immune system and cognition. Features Develops a proof of the Jordan Canonical form to show some basic ideas in algebraic topology Provides a thorough treatment of topological spaces, finishing with the Krein-Milman theorem Discusses topological degree theory (Brouwer, Leray-Schauder, and Coincidence) Carefully develops manifolds and functions on manifolds ending with Riemannian metrics Suitable for advanced students in mathematics and associated disciplines Can be used as a traditional textbook as well as for self-study Author James K. Peterson is an Emeritus Professor at the School of Mathematical and Statistical Sciences, Clemson University. He tries hard to build interesting models of complex phenomena using a blend of mathematics, computation, and science. To this end, he has written four books on how to teach such things to biologists and cognitive scientists. These books grew out of his Calculus for Biologists courses offered to the biology majors from 2007 to 2015. He has taught the analysis courses since he started teaching both at Clemson and at his previous post at Michigan Technological University. In between, he spent time as a senior engineer in various aerospace firms and even did a short stint in a software development company. The problems he was exposed to were very hard, and not amenable to solution using just one approach. Using tools from many branches of mathematics, from many types of computational languages, and from first-principles analysis of natural phenomena was absolutely essential to make progress. In both mathematical and applied areas, students often need to use advanced mathematics tools they have not learned properly. So, he has recently written a series of five books on mathematical analysis to help researchers with the problem of learning new things after they have earned their degrees and are practicing scientists. Along the way, he has also written papers in immunology, cognitive science, and neural network technology, in addition to having grants from the NSF, NASA, and the US Army. He also likes to paint, build furniture, and write stories.

Scale Space Methods in Computer Vision Lewis D. Griffin 2007-10-06 The refereed proceedings of the 4th International Conference on Scale Space Methods in Computer Vision, Scale-Space 2003, held at Isle of Skye, UK in June 2003. The 56 revised full papers presented were carefully reviewed and selected from 101 submissions. The book offers topical sections on deep structure representations, scale space mathematics, equivalences, implementing scale spaces, minimal approaches, evolution equations, local structure, image models, morphological scale spaces, temporal scale spaces, shape, and motion and stereo.

Aspects Of Complex Analysis, Differential Geometry, Mathematical Physics And Applications - Proceedings Of The Fourth International Workshop On Complex Structures And Vector Fields Dimiev Stancho 1999-09-17 This volume constitutes the proceedings of a workshop whose main purpose was to exchange information on current topics in complex analysis, differential geometry, mathematical physics and applications, and to group aspects of new mathematics.

The Finite Element Method for Solid and Structural Mechanics Olek C Zienkiewicz 2013-11-08 The Finite Element Method for Solid and Structural Mechanics is the key text and reference for engineers, researchers and senior students dealing with the analysis and modeling of structures, from large civil engineering projects such as dams to aircraft structures and small engineered components. This edition brings a thorough update and rearrangement of the book's content, including new chapters on: Material constitution using representative volume elements Differential geometry and calculus on manifolds Background mathematics and linear shell theory Focusing on the core knowledge, mathematical and analytical tools needed for successful structural analysis and modeling, The Finite Element Method for Solid and Structural Mechanics is the authoritative resource of choice for graduate level students, researchers and professional engineers. A proven keystone reference in the library of any engineer needing to apply the finite element method to solid mechanics and structural design. Founded by an influential pioneer in the field and updated in this seventh edition by an author team incorporating academic authority and industrial simulation experience. Features new chapters on topics including material constitution using representative volume elements, as well as consolidated and expanded sections on rod and shell models.

Perspectives of Complex Analysis, Differential Geometry and Mathematical Physics Stancho Dimiev 2001 The Deligne-Simpson problem for zero index of rigidity / V.P. Rostov -- Theorems for extension on manifolds with almost complex structures / L.N. Apostolova, M.S. Marinov and K.P. Petrov -- The theorem on analytic representation on hypersurface with singularities / A.M. Kytmanov and S.G. Myslivets -- Pseudogroup structures on Spencer manifolds / S. Dimiev -- Type-changing transformations of Hurwitz pairs, quasiregular functions, and hyper Kahlerian holomorphic chains I / J. Lawrynowicz and L.M. Tovar -- Embedding of the moduli space of Riemann surfaces with Igeta structures into the Sato Grassmann manifold / Y. Hashimoto and K. Ohba -- On the quotient spaces of S2 x S2 under the natural action of subgroups of D4 / K. Kikuchi -- Existence of spin structures on cyclic branched covering spaces over four-manifolds / S. Nagami -- Length spectrum of geodesic spheres in rank one symmetric spaces / T. Adachi -- Grassmann geometry of 6-dimensional sphere, II / H. Hashimoto and K. Mashimo -- Hypersurfaces in Euclidean space which are one-parameter families of spheres / G. Ganchev and V. Mihova -- Hypersurfaces of conullity two in Euclidean space which are one-parameter systems of torses / G. Ganchev and V. Milousheva -- Real hypersurfaces of a Kaehler manifold (the sixteen classes) / G. Ganchev and M. Hristov -- Almost contact B-metric hypersurfaces of Kaehlerian manifolds with B-metric / M. Manev -- Projective formalism and some methods from algebraic geometry in the theory of gravitation / B.G. Dimitrov -- Geometry of manifolds and dark matter / I.B. Pestov -- Lagrangian fluid mechanics / S. Manoff -- Transformation of connectednesses / G. Zlatanov

Quantization, Nonlinear Partial Differential Equations, and Operator Algebra John Von Neumann 1996 Recent inroads in higher-dimensional nonlinear quantum field theory and in the global theory of relevant nonlinear wave equations have been accompanied by very interesting cognate developments. These developments include symplectic quantization theory on manifolds and in group representations, the operator algebraic implementation of quantum dynamics, and differential geometric, general relativistic, and purely algebraic aspects. Quantization and Nonlinear Wave Equations thus was highly appropriate as the theme for the first John von Neumann Symposium (June 1994) held at MIT. The symposium was intended to treat topics of emerging signifigance underlying future mathematical developments. This book describes the outstanding recent progress in this important and challenging field and presents general background for the scientific context and specifics regarding key difficulties. Quantization is developed in the context of rigorous nonlinear quantum field theory in four dimensions and in connection with symplectic manifold theory and random Schrodinger operators. Nonlinear wave equations are exposed in relation to recent important progress in general relativity, in purely mathematical terms of microlocal analysis, and as represented by progress on the relativistic Boltzmann equation. Most of the developments in this volume appear in book form for the first time. The resulting work is a concise and informative way to explore the field and the spectrum of methods available for its investigation.

The Structure and Interpretation of the Standard Model Gordon McCabe 2011-08-30 This book provides a philosophically informed and mathematically rigorous introduction to the 'standard model' of particle physics. The standard model is the currently accepted and experimentally verified model of all the particles and interactions in our universe. All the elementary particles in our universe, and all the non-gravitational interactions -the strong nuclear force, the weak nuclear force, and the electromagnetic force - are collected together and, in the case of the weak and electromagnetic forces, unified in the standard model. Rather than presenting the calculational recipes favored in most treatments of the standard model, this text focuses upon the elegant mathematical structures and the foundational concepts of the standard model. · Combines an exposition of the philosophical foundations and rigorous mathematical structure of particle physics · Demonstrates the standard model with elegant mathematics, rather than a medley of computational recipes · Promotes a group-theoretical and fibre-bundle approach to the standard model, rather than the Lagrangian approach favoured by calculationalists · Explains the different approaches to particle physics and the standard model which can be found within the literature

Mathematische Physik: Klassische Mechanik Andreas Knauf 2017-10-05 Als Grenztheorie der Quantenmechanik besitzt die klassische Dynamik einen großen Formenreichtum - vom gut berechenbaren bis zum chaotischen Verhalten. Ausgehend von interessanten Beispielen wird in dem Band nicht nur eine gelungene Auswahl grundlegender Themen vermittelt, sondern auch der Einstieg in viele aktuelle Forschungsgebiete im Bereich der klassischen Mechanik. Didaktisch geschickt aufgebaut und mit hilfreichen Anhängen versehen, werden lediglich Kenntnisse der Grundvorlesungen in Mathematik vorausgesetzt. Mit über 100 Aufgaben und Lösungen.

Mathematical Physics: Classical Mechanics Andreas Knauf 2018-02-24 As a limit theory of quantum mechanics, classical dynamics comprises a large variety of phenomena, from computable (integrable) to chaotic (mixing) behavior. This book presents the KAM (Kolmogorov-Arnold-Moser) theory and asymptotic completeness in classical scattering. Including a wealth of fascinating examples in physics, it offers not only an excellent selection of basic topics, but also an introduction to a number of current areas of research in the field of classical mechanics. Thanks to the didactic structure and concise appendices, the presentation is self-contained and requires only knowledge of the basic courses in mathematics. The book addresses the needs of graduate and senior undergraduate students in mathematics and physics, and of researchers interested in approaching classical mechanics from a modern point of view.

From Micro to Macro Quantum Systems K Kong Wan 2006-03-03 Traditional quantum theory has a very rigid structure, making it difficult to accommodate new properties emerging from novel systems. This book presents a flexible and unified theory for physical systems, from micro and macro quantum to classical. This is achieved by incorporating superselection rules and maximal symmetric operators into the theory. The resulting theory is applicable to classical, microscopic quantum and non-orthodox mixed quantum systems of which macroscopic quantum systems are examples. A unified formalism also greatly facilitates the discussion of interactions between these systems. A scheme of quantization by parts is introduced, based on the mathematics of selfadjoint and maximal symmetric extensions of symmetric operators, to describe point interactions. The results are applied to treat superconducting quantum circuits in various configurations. This book also discusses various topics of interest such as the asymptotic treatment of quantum state preparation and quantum measurement, local observables and local values, Schrödinger's cat states in superconducting systems, and a path space formulation of quantum mechanics. This self-contained book is complete with a review of relevant geometric and operator theories, for example, vector fields and operators, symmetric operators and their maximal symmetric extensions, direct integrals of Hilbert spaces and operators. Contents:Aspects of Geometric and Operator Theories:Manifolds and Dynamical SystemsOperators and Their Direct IntegralsOrthodox and Generalized Quantum Mechanics:Orthodox Quantum MechanicsPhysical Theory in Hilbert SpaceGeneralized Quantum MechanicsPoint Interactions, Macroscopic Quantum Systems and Superselection Rules:Point InteractionsMacroscopic Quantum SystemsAsymptotic Disjointness, Asymptotic Separability, Quantum Mechanics on Path Space and Superselection Rules:Separability and DecoherenceQuantum Mechanics on Path Space Readership: Theoretical and mathematical physicists, applied and pure mathematicians, physicists and philosophers of science (with an interest in quantum theory). Key Features:Rigorous formulation of a unified theory in a form directly applicable to physical systemsIntroduction of a quantization-by-part scheme to treat point interactionsSystematic and explicit treatment of quantum circuits in terms of point interactionsDistinctive selection of materials rarely discussed elsewhere, including a large number of examples and contemporary topicsDiscussions on the interplay of mathematics and physicsKeywords:Quantum Mechanics;Quantization;Macroscopic Quantum Systems;Superconducting Circuits;Point Contact InteractionsReviews:"Numerous sections of the book can be studied (and are really worth studying) like a textbook and without the necessity of going through the rest of the volume … certainly, everyone who works through the book will be rewarded by an enhanced comprehension of orthodox quantum theory … there are many solid reasons for recommending this book to the whole community of physicists and mathematicians — from graduate students to researchers — interested in a fresh description of the microscopic and macroscopic quantum worlds."Mathematical Reviews

Basic Theory Anatoly Kochubei 2019-02-19 This multi-volume handbook is the most up-to-date and comprehensive reference work in the field of fractional calculus and its numerous applications. This first volume collects authoritative chapters covering the mathematical theory of fractional calculus, including fractional-order operators, integral transforms and equations, special functions, calculus of variations, and probabilistic and other aspects.

Kinematics and Dynamics of Multi-Body Systems J. Angeles 2014-05-04 Three main disciplines in the area of multibody systems are covered: kinematics, dynamics, and control, as pertaining to systems that can be modelled as coupling or rigid bodies. The treatment is intended to give a state of the art of the topics discussed.

Differential Geometry and Lie Groups Jean Gallier 2020-08-18 This textbook explores advanced topics in differential geometry, chosen for their particular relevance to modern geometry processing. Analytic and algebraic perspectives augment core topics, with the authors taking care to motivate each new concept. Whether working toward theoretical or applied questions, readers will appreciate this accessible exploration of the mathematical concepts behind many modern applications. Beginning with an in-depth study of tensors and differential forms, the authors go on to explore a selection of topics that showcase these tools. An analytic theme unites the early chapters, which cover distributions, integration on manifolds and Lie groups, spherical harmonics, and operators on Riemannian manifolds. An exploration of bundles follows, from definitions to connections and curvature in vector bundles, culminating in a glimpse of Pontrjagin and Chern classes. The final chapter on Clifford algebras and Clifford groups draws the book to an algebraic conclusion, which can be seen as a generalized viewpoint of the quaternions. Differential Geometry and Lie Groups: A Second Course captures the mathematical theory needed for advanced study in differential geometry with a view to furthering geometry processing capabilities. Suited to classroom use or independent study, the text will appeal to students and professionals alike. A first course in differential geometry is assumed; the authors' companion volume Differential Geometry and Lie Groups: A Computational Perspective provides the ideal preparation.

Basic Complex Analysis: A Comprehensive Course in Analysis, Part 2A Barry Simon 2015-11-02 A Comprehensive Course in Analysis by Poincaré Prize winner Barry Simon is a five-volume set that can serve as a graduate-level analysis textbook with a lot of additional bonus information, including hundreds of problems and numerous notes that extend the text and provide important historical background. Depth and breadth of exposition make this set a valuable reference source for almost all areas of classical analysis. Part 2A is devoted to basic complex analysis. It interweaves three analytic threads associated with Cauchy, Riemann, and Weierstrass, respectively. Cauchy's view focuses on the differential and integral calculus of functions of a complex variable, with the key topics being the Cauchy integral formula and contour integration. For Riemann, the geometry of the complex plane is central, with key topics being fractional linear transformations and conformal mapping. For Weierstrass, the power series is king, with key topics being spaces of analytic functions, the product formulas of Weierstrass and Hadamard, and the Weierstrass theory of elliptic functions. Subjects in this volume that are often missing in other texts include the Cauchy integral theorem when the contour is the boundary of a Jordan region, continued fractions, two proofs of the big Picard theorem, the uniformization theorem, Ahlfors's function, the sheaf of analytic germs, and Jacobi, as well as Weierstrass, elliptic functions.

Analysis, Complex Geometry, and Mathematical Physics Paul M. N. Feehan 2015-07-21 This volume contains the proceedings of the Conference on Analysis, Complex Geometry and Mathematical Physics: In Honor of Duong H. Phong, which was held from May 7-11, 2013, at Columbia University, New York. The conference featured thirty speakers who spoke on a range of topics reflecting the breadth and depth of the research interests of Duong H. Phong on the occasion of his sixtieth birthday. A common thread, familiar from Phong's own work, was the focus on the interplay between the deep tools of analysis and the rich structures of geometry and physics. Papers included in this volume cover topics such as the complex Monge-Ampère equation, pluripotential theory, geometric partial differential equations, theories of integral

operators, integrable systems and perturbative superstring theory.
Topics In Complex Analysis, Differential Geometry And Methematical Physics - Proceedings Of The Third International Workshop On Complex Structures And Vector Fields Stancho Dimiev 1997-07-01 The Third International Workshop on Complex Structures and Vector Fields was held to exchange information on current topics in complex analysis, differential geometry and mathematical physics, and to find new subjects in these fields.This volume contains many interesting and important articles in complex analysis (including quaternionic analysis), functional analysis, topology, differential geometry (hermitian geometry, surface theory), and mathematical physics (quantum mechanics, hamilton mechanics).
Quantum Field Theory III: Gauge Theory Eberhard Zeidler 2011-08-17 In this third volume of his modern introduction to quantum field theory, Eberhard Zeidler examines the mathematical and physical aspects of gauge theory as a principle tool for describing the four fundamental forces which act in the universe: gravitative, electromagnetic, weak interaction and strong interaction. Volume III concentrates on the classical aspects of gauge theory, describing the four fundamental forces by the curvature of appropriate fiber bundles. This must be supplemented by the crucial, but elusive quantization procedure. The book is arranged in four sections, devoted to realizing the universal principle force equals curvature: Part I: The Euclidean Manifold as a Paradigm Part II: Ariadne's Thread in Gauge Theory Part III: Einstein's Theory of Special Relativity Part IV: Ariadne's Thread in Cohomology For students of mathematics the book is designed to demonstrate that detailed knowledge of the physical background helps to reveal interesting interrelationships among diverse mathematical topics. Physics students will be exposed to a fairly advanced mathematics, beyond the level covered in the typical physics curriculum. Quantum Field Theory builds a bridge between mathematicians and physicists, based on challenging questions about the fundamental forces in the universe (macrocosmos), and in the world of elementary particles (microcosmos).
Physics letters : [part A]. 1995
CARs and FOF, 8th International Conference on CAD/CAM, Robotics and Factories of the Future 1992
Shell Structures: Theory and Applications Wojciech Pietraszkiewicz 2013-09-18 Shells are basic structural elements of modern technology and everyday life. Examples are automobile bodies, water and oil tanks, pipelines, aircraft fuselages, nanotubes, graphene sheets or beer cans. Also nature is full of living shells such as leaves of trees, blooming flowers, seashells, cell membranes, the double helix of DNA or wings of insects. In the human body arteries, the shell of the eye, the diaphragm, the skin or the pericardium are all shells as well. Shell Structures: Theory and Applications, Volume 3 contains 137 contributions presented at the 10th Conference “Shell Structures: Theory and Applications” held October 16-18, 2013 in Gdansk, Poland. The papers cover a wide spectrum of scientific and engineering problems which are divided into seven broad groups: general lectures, theoretical modelling, stability, dynamics, bioshells, numerical analyses, and engineering design. The volume will be of interest to researchers and designers dealing with modelling and analyses of shell structures and thin-walled structural elements.
Analysis, Manifolds and Physics Revised Edition Yvonne Choquet-Bruhat 1982 This reference book, which has found wide use as a text, provides an answer to the needs of graduate physical mathematics students and their teachers. The present edition is a thorough revision of the first, including a new chapter entitled ``Connections on Principle Fibre Bundles'' which includes sections on holonomy, characteristic classes, invariant curvature integrals and problems on the geometry of gauge fields, monopoles, instantons, spin structure and spin connections. Many paragraphs have been rewritten, and examples and exercises added to ease the study of several chapters. The index includes over 130 entries.
Theory of Knowledge Mark Burgin 2016-10-27 This book aims to synthesize different directions in knowledge studies into a unified theory of knowledge and knowledge processes. It explicates important relations between knowledge and information. It provides the readers with understanding of the essence and structure of knowledge, explicating operations and process that are based on knowledge and vital for society. The book also highlights how the theory of knowledge paves the way for more advanced design and utilization of computers and networks.
Contents:IntroductionKnowledge Characteristics and TypologyKnowledge Evaluation and Validation in the Context of Epistemic StructuresKnowledge Structure and Functioning: Microlevel or Quantum Theory of KnowledgeKnowledge Structure and Functioning: Macrolevel or Theory of Average KnowledgeKnowledge Structure and Functioning: Megalevel or Global Theory of KnowledgeKnowledge Production, Acquisition, Engineering, and ApplicationKnowledge, Data, and InformationConclusion Readership: Graduate students and researchers in artificial intelligence and knowledge management.
Introduction to General Relativity, Black Holes, and Cosmology Yvonne Choquet-Bruhat 2015-01-21 General Relativity is a beautiful geometric theory, simple in its mathematical formulation but leading to numerous consequences with striking physical interpretations: gravitational waves, black holes, cosmological models, and so on. This introductory textbook is written for mathematics students interested in physics and physics students interested in exact mathematical formulations (or for anyone with a scientific mind who is curious to know more of the world we live in), recent remarkable experimental and observational results which confirm the theory are clearly described and no specialised physics knowledge is required. The mathematical level of Part A is aimed at undergraduate students and could be the basis for a course on General Relativity. Part B is more advanced, but still does not require sophisticated mathematics. Based on Yvonne Choquet-Bruhat's more advanced text, General Relativity and the Einstein Equations, the aim of this book is to give with precision, but as simply as possible, the foundations and main consequences of General Relativity. The first five chapters from General Relativity and the Einstein Equations have been updated with new sections and chapters on black holes, gravitational waves, singularities, and the Reissner-Nordstrom and interior Schwarzchild solutions. The rigour behind this book will provide readers with the perfect preparation to follow the great mathematical progress in the actual development, as well as the ability to model, the latest astrophysical and cosmological observations. The book presents basic General Relativity and provides a basis for understanding and using the fundamental theory.
Oxford Users' Guide to Mathematics Eberhard Zeidler 2004-08-19 The Oxford Users' Guide to Mathematics is one of the leading handbooks on mathematics available. It presents a comprehensive modern picture of mathematics and emphasises the relations between the different branches of mathematics, and the applications of mathematics in engineering and the natural sciences. The Oxford User's Guide covers a broad spectrum of mathematics starting with the basic material and progressing on to more advanced topics that have come to the fore in the last few decades. The book is organised into mathematical sub-disciplines including analysis, algebra, geometry, foundations of mathematics, calculus of variations and optimisation, theory of probability and mathematical statistics, numerical mathematics and scientific computing, and history of mathematics. The book is supplemented by numerous tables on infinite series, special functions, integrals, integral transformations, mathematical statistics, and fundamental constants in physics. It also includes a comprehensive bibliography of key contemporary literature as well as an extensive glossary and index. The wealth of material, reaching across all levels and numerous sub-disciplines, makes The Oxford User's Guide to Mathematics an invaluable reference source for students of engineering, mathematics, computer science, and the natural sciences, as well as teachers, practitioners, and researchers in industry and academia.