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[Harmonic Analysis for Engineers and Applied Scientists](#) Courier Dover Publications

Although the Fourier transform is among engineering's most widely used mathematical tools, few engineers realize that the extension of harmonic analysis to functions on groups holds great potential for solving problems in robotics, image analysis, mechanics, and other areas. This self-contained approach, geared toward readers with a standard background in engineering mathematics, explores the widest possible range of applications to fields such as robotics, mechanics, tomography, sensor calibration, estimation and control, liquid crystal analysis, and conformational statistics of macromolecules. Harmonic analysis is explored in terms of particular Lie groups, and the text deals with only a limited number of proofs, focusing instead on specific applications and fundamental mathematical results. Forming a bridge between pure mathematics and the challenges of modern engineering, this updated and expanded volume offers a concrete, accessible treatment that places the general theory in the context of specific groups.

[Introduction to General Topology](#) American Mathematical Soc.

This text contains a detailed introduction to general topology and an introduction to algebraic topology via its most classical and elementary segment. Proofs of theorems are separated from their formulations and are gathered at the end of each chapter, making this book appear like a problem book and also giving it appeal to the expert as a handbook. The book includes about 1,000 exercises.

[Shock Formation in Small-Data Solutions to 3D Quasilinear Wave Equations](#) Courier Dover Publications
Aimed at second year graduate students, this text introduces them to cohomology theory (involving a rich interplay between algebra and topology) with a minimum of prerequisites. No homological algebra is assumed beyond what is normally learned in a first course in algebraic topology, and the basics of the subject, as well as exercises, are given prior to discussion of more specialized topics.

[Principles of Topology](#) Prentice Hall

This textbook is a completely revised, updated, and expanded English edition of the important *Analyse fonctionnelle* (1983). In addition, it contains a wealth of problems and exercises (with solutions) to guide the reader. Uniquely, this book presents in a coherent, concise and unified way the main results from functional analysis together with the main results from the theory of partial differential equations (PDEs). Although there are many books on functional analysis and many on PDEs, this is the first to cover both of these closely connected topics. Since the French book was first published, it has been translated into Spanish, Italian, Japanese, Korean, Romanian, Greek and Chinese. The English edition makes a welcome addition to this list.

[Functional Analysis, Sobolev Spaces and Partial Differential Equations](#) Springer Science & Business Media

[An Introduction to Nonlinear Analysis: Theory](#) is an overview of some basic, important aspects of Nonlinear Analysis, with an emphasis on those not included in the classical treatment of the field. Today Nonlinear Analysis is a very prolific part of modern mathematical analysis, with fascinating theory and many different applications ranging from mathematical physics and engineering to social sciences and economics. Topics covered in this book include the necessary background material from topology, measure theory and functional analysis (Banach space theory). The text also deals with multivalued analysis and basic features of nonsmooth analysis, providing a solid background for the more applications-oriented material of the book [An Introduction to Nonlinear Analysis: Applications](#) by the same authors. The book is self-contained and accessible to the newcomer, complete with numerous examples, exercises and solutions. It is a valuable tool, not only for specialists in the field interested in technical details, but also for scientists entering Nonlinear Analysis in search of promising directions for research.

[Handbook of Dynamical Systems](#) Springer Science & Business Media

This volume deals with the theory of finite topological spaces and its relationship with the homotopy and simple homotopy theory of polyhedra. The interaction between their intrinsic combinatorial and topological structures makes finite spaces a useful tool for studying problems in Topology, Algebra and Geometry from a new perspective. In particular, the methods developed in this manuscript are used to study Quillen's conjecture on the poset of p -subgroups of a finite group and the Andrews-Curtis conjecture on the 3-deformability of contractible two-dimensional complexes. This self-contained work constitutes the first detailed exposition on the algebraic topology of finite spaces. It is intended for topologists and combinatorialists, but it is also recommended for advanced undergraduate students and graduate students with a modest knowledge of Algebraic Topology.

[Computational Topology](#) Springer Nature

"Topology of Metric Spaces gives a very streamlined development of a course in metric space topology emphasizing only the most useful concepts, concrete spaces and geometric ideas to encourage geometric thinking, to treat this as a preparatory ground for a general topology course, to use this course as a surrogate for real analysis and to help the students gain some perspective of modern analysis." "Eminently suitable for self-study, this book may also be used as a supplementary text for courses in general (or point-set) topology so that students will acquire a lot of concrete examples of spaces and maps."--BOOK JACKET.

[Handbook of Computer Aided Geometric Design](#) Springer

This book explores the connection between algebraic structures in topology and computational methods for 3-dimensional electric and magnetic field computation.

The connection between topology and electromagnetism has been known since the 19th century, but there has been little exposition of its relevance to computational methods in modern topological language. This book is an effort to close that gap. It will be of interest to people working in finite element methods for electromagnetic computation and those who have an interest in numerical and industrial applications of algebraic topology.

[Elementary Topology](#) Springer Science & Business Media

In 1848 James Challis showed that smooth solutions to the compressible Euler equations can become multivalued, thus signifying the onset of a shock singularity.

Today it is known that, for many hyperbolic systems, such singularities often develop. However, most shock-formation results have been proved only in one spatial dimension. Serge Alinhac's groundbreaking work on wave equations in the late 1990s was the first to treat more than one spatial dimension. In 2007, for the compressible Euler equations in vorticity-free regions, Demetrios Christodoulou remarkably sharpened Alinhac's results and gave a complete description of shock formation. In this monograph, Christodoulou's framework is extended to two classes of wave equations in three spatial dimensions. It is shown that if the nonlinear terms fail to satisfy the null condition, then for small data, shocks are the only possible singularities that can develop. Moreover, the author exhibits an open set of small data whose solutions form a shock, and he provides a sharp description of the blow-up.

These results yield a sharp converse of the fundamental result of Christodoulou and Klainerman, who showed that small-data solutions are global when the null condition is satisfied. Readers who master the material will have acquired tools on the cutting edge of PDEs, fluid mechanics, hyperbolic conservation laws, wave equations, and geometric analysis.

[An Introduction to Riemannian Geometry](#) Courier Corporation

[An Introduction to Nonlinear Analysis: Theory](#) is an overview of some basic, important aspects of Nonlinear Analysis, with an emphasis on those not included in the classical treatment of the field. Today Nonlinear Analysis is a very prolific part of modern mathematical analysis, with fascinating theory and many different applications ranging from mathematical physics and engineering to social sciences and economics. Topics covered in this book include the necessary background material from topology, measure theory and functional analysis (Banach space theory). The text also deals with multivalued analysis and basic features of nonsmooth analysis, providing a solid background for the more applications-oriented material of the book [An Introduction to Nonlinear Analysis: Applications](#) by the same authors. The book is self-contained and accessible to the newcomer, complete with numerous examples, exercises and solutions. It is a valuable tool, not only for specialists in the field interested in technical details, but also for scientists entering Nonlinear Analysis in search of promising directions for research.

[Optimization and Control for Partial Differential Equations](#) Princeton University Press
Combining concepts from topology and algorithms, this book delivers what its title promises: an introduction to the field of computational topology. Starting with motivating problems in both mathematics and computer science and building up from classic topics in geometric and algebraic topology, the third part of the text advances to persistent homology. This point of view is critically important in turning a mostly theoretical field of mathematics into one that is relevant to a multitude of disciplines in the sciences and engineering. The main approach is the discovery of topology through algorithms. The book is ideal for teaching a graduate or advanced undergraduate course in computational topology, as it develops all the background of both the mathematical and algorithmic aspects of the subject from first principles. Thus the text could serve equally well in a course taught in a mathematics department or computer science department.

[Dynamics with Inequalities](#) CRC Press

Algebraic topology is a basic part of modern mathematics, and some knowledge of this area is indispensable for any advanced work relating to geometry, including topology itself, differential geometry, algebraic geometry, and Lie groups. This book provides a detailed treatment of algebraic topology both for teachers of the subject and for advanced graduate students in mathematics either specializing in this area or continuing on to other fields. J. Peter May's approach reflects the enormous internal developments within algebraic topology over the past several decades, most of which are largely unknown to mathematicians in other fields. But he also retains the classical presentations of various topics where appropriate. Most chapters end with problems that further explore and refine the concepts presented. The final four chapters provide sketches of substantial areas of algebraic topology that are normally omitted from introductory texts, and the book concludes with a list of suggested readings for those interested in delving further into the field.

[Approximating Solutions in Infinite Horizon Optimization](#) American Mathematical Soc.

This book highlights new developments in the wide and growing field of partial differential equations (PDE)-constrained optimization. Optimization problems where the dynamics evolve according to a system of PDEs arise in science, engineering, and economic applications and they can take the form of inverse problems, optimal control problems or optimal design problems. This book covers new theoretical, computational as well as implementation aspects for PDE-constrained optimization problems under uncertainty, in shape optimization, and in feedback control, and it illustrates the new developments on representative problems from a variety of applications.

[Parametric Lie Group Actions on Global Generalised Solutions of Nonlinear PDEs](#) American Mathematical Soc.

[Abstract Calculus: A Categorical Approach](#) provides an abstract approach to calculus. It is intended for graduate students pursuing PhDs in pure mathematics but junior and senior researchers in basically any field of mathematics and theoretical physics will also be interested. Any calculus text for undergraduate students majoring in engineering, mathematics or physics deals with the classical concepts of limits, continuity, differentiability, optimization, integrability, summability, and approximation. This book covers the exact same topics, but from a categorical perspective, making the classification of topological modules as the main category involved. Features Suitable for PhD candidates and researchers Requires prerequisites in set theory, general topology, and abstract algebra, but is otherwise self-contained Dr. Francisco Javier Garc í a-Pacheco is a full professor and Director of the Departmental Section of Mathematics at the College of Engineering of the

University of Cádiz, Spain.

Elsevier

This book presents global actions of arbitrary Lie groups on large classes of generalised functions by using a novel parametric approach. This new method extends and completes earlier results of the author and collaborators, in which global Lie group actions on generalised functions were only defined in the case of projectable or fibre-preserving Lie group actions. The parametric method opens the possibility of dealing with vastly larger classes of Lie semigroup actions which still transform solutions into solutions. These Lie semigroups can contain arbitrary noninvertible smooth mappings. Thus, they cannot be subsemigroups of Lie groups. Audience: This volume is addressed to graduate students and researchers involved in solving linear and nonlinear partial differential equations, and in particular, in dealing with the Lie group symmetries of their classical or generalised solutions.

Algebraic Topology of Finite Topological Spaces and Applications Elsevier

"In this chapter, we introduce some of the very basics that are used throughout the book. First, we give the definition of a topological space and related notions of open and closed sets, covers, subspace topology. To connect topology and geometry, we devote a section on metric spaces. Maps such as homeomorphism and homotopy equivalence that play a significant role to relate topological spaces. Certain categories of topological spaces become important for their wide presence in applications. Manifolds are one such category which we introduce in this chapter. Functions on them satisfying certain conditions are presented as Morse functions. The critical points of such functions relate to the topology of the manifold they are defined on. We introduce these concepts in the smooth setting in this chapter, and later adapt them for the piecewise linear domains frequently used for finite computations. Finally, a section on Notes points out to the history and relevant literature for the concepts delineated in the chapter. It ends with a series of exercises that may be used for teaching a class on the subject both at graduate and undergraduate level"--

Elementary Topology CRC Press

In this volume, the authors present a collection of surveys on various aspects of the theory of bifurcations of differentiable dynamical systems and related topics. By selecting these subjects, they focus on those developments from which research will be active in the coming years. The surveys are intended to educate the reader on the recent literature on the following subjects: transversality and generic properties like the various forms of the so-called Kupka-Smale theorem, the Closing Lemma and generic local bifurcations of functions (so-called catastrophe theory) and generic local bifurcations in 1-parameter families of dynamical systems, and notions of structural stability and moduli. Covers recent literature on various topics related to the theory of bifurcations of differentiable dynamical systems Highlights developments that are the foundation for future research in this field Provides material in the form of surveys, which are important tools for introducing the bifurcations of differentiable dynamical systems

Elements Of Algebraic Topology Springer Science & Business Media

The book presents a comprehensive exposition of extension results for maps between different geometric objects and of extension-trace results for smooth functions on subsets with no a priori differential structure (Whitney problems). The account covers development of the area from the initial classical works of the first half of the 20th century to the flourishing period of the last decade. Seemingly very specific these problems have been from the very beginning a powerful source of ideas, concepts and methods that essentially influenced and in some cases even transformed considerable areas of analysis. Aside from the material linked by the aforementioned problems the book also is unified by geometric analysis approach used in the proofs of basic results. This requires a variety of geometric tools from convex and combinatorial geometry to geometry of metric space theory to Riemannian and coarse geometry and more. The necessary facts are presented mostly with detailed proofs to make the book accessible to a wide audience.

Topology for Analysis Alpha Science Int'l Ltd.

The book is intended as a text for a one-semester graduate course in operator theory to be taught "from scratch", not as a sequel to a functional analysis course, with the basics of the spectral theory of linear operators taking the center stage. The book consists of six chapters and appendix, with the material flowing from the fundamentals of abstract spaces (metric, vector, normed vector, and inner product), the Banach Fixed-Point Theorem and its applications, such as Picard's Existence and Uniqueness Theorem, through the basics of linear operators, two of the three fundamental principles (the Uniform Boundedness Principle and the Open Mapping Theorem and its equivalents: the Inverse Mapping and Closed Graph Theorems), to the elements of the spectral theory, including Gelfand's Spectral Radius Theorem and the Spectral Theorem for Compact Self-Adjoint Operators, and its applications, such as the celebrated Lyapunov Stability Theorem. Conceived as a text to be used in a classroom, the book constantly calls for the student's actively mastering the knowledge of the subject matter. There are problems at the end of each chapter, starting with Chapter 2 and totaling at 150. Many important statements are given as problems and frequently referred to in the main body. There are also 432 Exercises throughout the text, including Chapter 1 and the Appendix, which require of the student to prove or verify a statement or an example, fill in certain details in a proof, or provide an intermediate step or a counterexample. They are also an inherent part of the material. More difficult problems are marked with an asterisk, many problems and exercises are supplied with "existential" hints. The book is generous on Examples and contains numerous Remarks accompanying definitions, examples, and statements to discuss certain subtleties, raise questions on whether the converse assertions are true, whenever appropriate, or whether the conditions are essential. With carefully chosen material, proper attention given to applications, and plenty of examples, problems, and exercises, this well-designed text is ideal for a one-semester Master's level graduate course in operator theory with emphasis on spectral theory for students majoring in mathematics, physics, computer science, and engineering. Contents Preface Preliminaries Metric Spaces Vector Spaces, Normed Vector Spaces, and Banach Spaces Linear Operators Elements of Spectral Theory in a Banach Space Setting Elements of Spectral Theory in a Hilbert Space Setting Appendix: The Axiom of Choice and Equivalents Bibliography Index

Analysis On Manifolds Courier Corporation

Starting with the first principles of topology, this volume advances to general analysis. Three levels of examples and problems make it appropriate for students and professionals. Abundant exercises, ordered and numbered by degree of difficulty, illustrate important concepts, and a 40-page appendix includes tables of theorems and counterexamples. 1970 edition.