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An Introduction to Functional Analysis-James C. Robinson 2020-02-29 Accessible text covering core functional analysis topics in Hilbert and Banach spaces, with detailed proofs and 200 fully-worked exercises.

Introduction to Functional Analysis with Applications-A. H. Siddiqi 2006 As science and technology are increasingly refined and interrelated, the demand for mathematical concepts beyond vector algebra and differential and integral calculus has greatly increased. There are four fundamental theorems dealing with properties of functionals and operators called Hahn-Banach theorem, Banach-Steinhaus theorem, Open mapping theorem and Closed graph theorem. Notions of differentiability and integrability of operators are also studied in functional analysis. Applications of functional analysis to operator equations, boundary value problems, optimization, variational inequalities, finite element methods, optimal control and wavelets are all discussed at length, reflecting current trends in the study of functional analysis. This book introduces the above concepts in a way accessible to readers having minimum possible prerequisite of undergraduate mathematics.

Introduction to Functional Analysis-Reinhold Meise 1997-07-31 The book is written for students of mathematics and physics who have a basic knowledge of analysis and linear algebra. It can be used as a textbook for courses and/or seminars in functional analysis. Starting from metric spaces it proceeds quickly to the central results of the field, including the theorem of HahnBanach. The spaces (p Lp (X,(), C(X)' and Sobolov spaces are introduced. A chapter on spectral theory contains the Riesz theory of compact operators, basic facts on Banach and C*-algebras and the spectral representation for bounded normal and unbounded self-adjoint operators in Hilbert spaces. An introduction to locally convex spaces and their duality theory provides the basis for a comprehensive treatment of Fr--eacute--;chet spaces and their duals. In particular recent results on sequences spaces, linear topological invariants and short exact sequences of Fr--eacute--;chet spaces and the splitting of such sequences are presented. These results are not contained in any other book in this field.

Introductory Functional Analysis with Applications-Kreyszig 2007-03 Market_Desc: · Undergraduate and Graduate Students in Mathematics and Physics· Engineering· Instructors

Functional Analysis-Yuli Eidelman 2004 The goal of this textbook is to provide an introduction to the methods and language of functional analysis, including Hilbert spaces, Fredholm theory for compact operators, and spectral theory of self-adjoint operators. It also presents the basic theorems and methods of abstract functional analysis and a few applications of these methods to Banach algebras and the theory of unbounded self-adjoint operators. The text corresponds to material for two semester courses (Part I and Part II, respectively), and it is as self-contained as possible. The only prerequisites for the first part are minimal amounts of linear algebra and calculus. However, for the second course (Part II), it is useful to have some knowledge of topology and measure theory. Each chapter is followed by numerous exercises, whose solutions are given at the end of the book.

Functional Analysis-Sergei Ovchinnikov 2018-06-09 This concise text provides a gentle introduction to functional analysis. Chapters cover essential topics such as special spaces, normed spaces, linear functionals, and Hilbert spaces. Numerous examples and counterexamples aid in the understanding of key concepts, while exercises at the end of each chapter provide ample opportunities for practice with the material. Proofs of theorems such as the Uniform Bounded Theory, the Open Mapping Theorem, and the Closed Graph Theorem are worked through step-by-step, providing an accessible avenue to understanding these important results. The prerequisites for this book are linear algebra and elementary real analysis, with two introductory chapters providing an overview of material necessary for the subsequent text. Functional Analysis offers an elementary approach ideal for the upper-undergraduate or beginning graduate student. Primarily intended for a one-semester introductory course, this text is also a perfect resource for independent study or as the basis for a reading course.

Functional Analysis-Joseph Muscat 2014-07-23 This textbook is an introduction to functional analysis suited to final year undergraduates or beginning graduates. Its various applications of Hilbert spaces, including least squares approximation, inverse problems, and Tikhonov regularization, should appeal not only to mathematicians interested in applications, but also to researchers in related fields. Functional Analysis adopts a self-contained approach to Banach spaces and operator theory that covers the main topics, based upon the classical sequence and function spaces and their operators. It assumes only a minimum of knowledge in elementary linear algebra and real analysis; the latter is redone in the light of metric spaces. It contains more than a thousand worked examples and exercises, which make up the main body of the book.

Functional Analysis-Terry J. Morrison 2011-10-14 A powerful introduction to one of the most active areas oftheoretical and applied mathematics This distinctive introduction to one of the most far-reaching andbeautiful areas of mathematics focuses on Banach spaces as themilieu in which most of the fundamental concepts are presented.While occasionally using the more general topological vector spaceand locally convex space setting, it emphasizes the development ofthe reader's mathematical maturity and the ability to bothunderstand and "do" mathematics. In so doing, Functional Analysisprovides a strong springboard for further exploration on the widerange of topics the book presents, including: * Weak topologies and applications * Operators on Banach spaces * Bases in Banach spaces * Sequences, series, and geometry in Banach spaces Stressing the general techniques underlying the proofs, FunctionalAnalysis also features many exercises for immediate clarificationof points under discussion. This thoughtful, well-organizedsynthesis of the work of those mathematicians who created thediscipline of functionalanalysis as we know it today also providesa rich source of research topics and reference material.

Functional Analysis-Markus Haase 2014-09-17 This book introduces functional analysis at an elementary level without assuming any background in real analysis, for example on metric spaces or Lebesgue integration. It focuses on concepts and methods relevant in applied contexts such as variational methods on Hilbert spaces, Neumann series, eigenvalue expansions for compact self-adjoint operators, weak differentiation and Sobolev spaces on intervals, and model applications to differential and integral equations. Beyond that, the final chapters on the uniform boundedness theorem, the open mapping theorem and the Hahn-Banach theorem provide a stepping-stone to more advanced texts. The exposition is clear and rigorous, featuring full and detailed proofs. Many examples illustrate the new notions and results. Each chapter concludes with a large collection of exercises, some of which are referred to in the margin of the text, tailor-made in order to guide the student digesting the new material. Optional sections and chapters supplement the mandatory parts and allow for modular teaching spanning from basic to honors track level.

From Vector Spaces to Function Spaces-Yutaka Yamamoto 2012-01-01 This book provides a treatment of analytical methods of applied mathematics. It starts with a review of the basics of vector spaces and brings the reader to an advanced discussion of applied mathematics, including the latest applications to systems and control theory. The text is designed to be accessible to those not familiar with the material and useful to working scientists, engineers, and mathematics students. The author provides the motivations of definitions and the ideas underlying proofs but does not sacrifice mathematical rigor. From Vector Spaces to Function Spaces presents: an easily accessible discussion of analytical methods of applied mathematics from vector spaces to distributions, Fourier analysis, and Hardy spaces with applications to system theory; an introduction to modern functional analytic methods to better familiarize readers with basic methods and mathematical thinking; and an understandable yet penetrating treatment of such modern methods and topics as function spaces and distributions, Fourier and Laplace analyses, and Hardy spaces.

Introductory Functional Analysis-B.D. Reddy 2013-11-27 Providing an introduction to functional analysis, this text treats in detail its application to boundary-value problems and finite elements, and is distinguished by the fact that abstract concepts are motivated and illustrated wherever possible. It is intended for use by senior undergraduates and graduates in mathematics, the physical sciences and engineering, who may not have been exposed to the conventional prerequisites for a course in functional analysis, such as real analysis. Mature researchers wishing to learn the basic ideas of functional analysis will equally find this useful. Offers a good grounding in those aspects of

functional analysis which are most relevant to a proper understanding and appreciation of the mathematical aspects of boundary-value problems and the finite element method.

Functional Analysis for Physics and Engineering-Hiroyuki Shima 2016-01-05 This book provides an introduction to functional analysis for non-experts in mathematics. As such, it is distinct from most other books on the subject that are intended for mathematicians. Concepts are explained concisely with visual materials, making it accessible for those unfamiliar with graduate-level mathematics. Topics include topology, vector spaces, tensor spaces, Lebesgue integrals, and operators, to name a few. Two central issues—the theory of Hilbert space and the operator theory—and how they relate to quantum physics are covered extensively. Each chapter explains, concisely, the purpose of the specific topic and the benefit of understanding it. Researchers and graduate students in physics, mechanical engineering, and information science will benefit from this view of functional analysis.

Introduction to Functional Analysis-Angus Ellis Taylor 1958

Functional Analysis for Probability and Stochastic Processes-Adam Bobrowski 2005-08-11 This text is designed both for students of probability and stochastic processes, and for students of functional analysis. It presents some chosen parts of functional analysis that can help understand ideas from probability and stochastic processes. The subjects range from basic Hilbert and Banach spaces, through weak topologies and Banach algebras, to the theory of semigroups of bounded linear operators. Numerous standard and non-standard examples and exercises make the book suitable as a course textbook as well as for self-study.

A First Course in Functional Analysis-Rabindranath Sen 2014-11-01 This book provides the reader with a comprehensive introduction to functional analysis. Topics include normed linear and Hilbert spaces, the Hahn-Banach theorem, the closed graph theorem, the open mapping theorem, linear operator theory, the spectral theory, and a brief introduction to the Lebesgue measure. The book explains the motivation for the development of these theories, and applications that illustrate the theories in action. Applications in optimal control theory, variational problems, wavelet analysis and dynamical systems are also highlighted. 'A First Course in Functional Analysis' will serve as a ready reference to students not only of mathematics, but also of allied subjects in applied mathematics, physics, statistics and engineering.

Linear Functional Analysis-Hans Wilhelm Alt 2016-07-06 This book gives an introduction to Linear Functional Analysis, which is a synthesis of algebra, topology, and analysis. In addition to the basic theory it explains operator theory, distributions, Sobolev spaces, and many other things. The text is self-contained and includes all proofs, as well as many exercises, most of them with solutions. Moreover, there are a number of appendices, for example on Lebesgue integration theory. A complete introduction to the subject, Linear Functional Analysis will be particularly useful to readers who want to quickly get to the key statements and who are interested in applications to differential equations.

Functional Analysis-Gerardo Chacón 2016-12-19 This textbook on functional analysis offers a short and concise introduction to the subject. The book is designed in such a way as to provide a smooth transition between elementary and advanced topics and its modular structure allows for an easy assimilation of the content. Starting from a dedicated chapter on the axiom of choice, subsequent chapters cover Hilbert spaces, linear operators, functionals and duality, Fourier series, Fourier transform, the fixed point theorem, Baire categories, the uniform bounded principle, the open mapping theorem, the closed graph theorem, the Hahn–Banach theorem, adjoint operators, weak topologies and reflexivity, operators in Hilbert spaces, spectral theory of operators in Hilbert spaces, and compactness. Each chapter ends with workable problems. The book is suitable for graduate students, but also for advanced undergraduates, in mathematics and physics. Contents: List of Figures Basic Notation Choice Principles Hilbert Spaces Completeness, Completion and Dimension Linear Operators Functionals and Dual Spaces Fourier Series Fourier Transform Fixed Point Theorem Baire Category Theorem Uniform Boundedness Principle Open Mapping Theorem Closed Graph Theorem Hahn–Banach Theorem The Adjoint Operator Weak Topologies and Reflexivity Operators in Hilbert Spaces Spectral Theory of Operators on Hilbert Spaces Compactness Bibliography Index

Introduction to Functional Analysis-S C Bose 2000-02-01 This book contains all the basic facts of functional analysis relevant to a first course. It is completely self-contained, and would be a valuable introductory text for postgraduate mathematics students.

An Introductory Course in Functional Analysis-Adam Bowers 2014-12-11 Based on a graduate course by the celebrated analyst Nigel Kalton, this well-balanced introduction to functional analysis makes clear not only how, but why, the field developed. All major topics belonging to a first course in functional analysis are covered. However, unlike traditional introductions to the subject, Banach spaces are emphasized over Hilbert spaces, and many details are presented in a novel manner, such as the proof of the Hahn–Banach theorem based on an inf-convolution technique, the proof of Schauder's theorem, and the proof of the Milman–Pettis theorem. With the inclusion of many illustrative examples and exercises, An Introductory Course in Functional Analysis equips the reader to apply the theory and to master its subtleties. It is therefore well-suited as a textbook for a one- or two-semester introductory course in functional analysis or as a companion for independent study.

Principles of Functional Analysis-Martin Schechter 2001-11-13 This excellent book provides an elegant introduction to functional analysis ... carefully selected problems ... This is a nicely written book of great value for stimulating active work by students. It can be strongly recommended as an undergraduate or graduate text, or as a comprehensive book for self-study. --European Mathematical Society Newsletter Functional analysis plays a crucial role in the applied sciences as well as in mathematics. It is a beautiful subject that can be motivated and studied for its own sake. In keeping with this basic philosophy, the author has made this introductory text accessible to a wide spectrum of students, including beginning-level graduates and advanced undergraduates. The exposition is inviting, following threads of ideas, describing each as fully as possible, before moving on to a new topic. Supporting material is introduced as appropriate, and only to the degree needed. Some topics are treated more than once, according to the different contexts in which they arise. The prerequisites are minimal, requiring little more than advanced calculus and no measure theory. The text focuses on normed vector spaces and their important examples, Banach spaces and Hilbert spaces. The author also includes topics not usually found in texts on the subject. This Second Edition incorporates many new developments while not overshadowing the book's original flavor. Areas in the book that demonstrate its unique character have been strengthened. In particular, new material concerning Fredholm and semi-Fredholm operators is introduced, requiring minimal effort as the necessary machinery was already in place. Several new topics are presented, but relate to only those concepts and methods emanating from other parts of the book. These topics include perturbation classes, measures of noncompactness, strictly singular operators, and operator constants. Overall, the presentation has been refined, clarified, and simplified, and many new problems have been added. The book is recommended to advanced undergraduates, graduate students, and pure and applied research mathematicians interested in functional analysis and operator theory.

Functional Analysis-Elias M. Stein 2011-09-11 "This book covers such topics as L^p spaces, distributions, Baire category, probability theory and Brownian motion, several complex variables and oscillatory integrals in Fourier analysis. The authors focus on key results in each area, highlighting their importance and the organic unity of the subject"--Provided by publisher.

A Friendly Approach to Functional Analysis-Amol Sasane 2017-02-20 This book constitutes a concise introductory course on Functional Analysis for students who have studied calculus and linear algebra. The topics covered are Banach spaces, continuous linear transformations, Frechet derivative, geometry of Hilbert spaces, compact operators, and distributions. In addition, the book includes selected applications of functional analysis to differential equations, optimization, physics (classical and quantum mechanics), and numerical analysis. The book contains 197 problems, meant to reinforce the fundamental concepts. The inclusion of detailed solutions to all the exercises makes the book ideal also for self-study. A Friendly Approach to Functional Analysis is written specifically for undergraduate students of pure mathematics and engineering, and those studying joint programmes with mathematics. Request Inspection Copy

Introduction to Functional Analysis-Angus Ellis Taylor 1980

A Course in Functional Analysis and Measure Theory-Vladimir Kadets 2018-07-10 Written by an expert on the topic and experienced lecturer, this textbook provides an elegant, self-contained introduction to functional analysis, including several advanced topics and applications to harmonic analysis. Starting from basic topics before proceeding to more advanced material, the book covers measure and integration theory, classical Banach and Hilbert space theory, spectral theory for bounded operators, fixed point theory, Schauder bases, the Riesz-Thorin interpolation theorem for operators, as well as topics in duality and convexity theory. Aimed at advanced undergraduate and graduate students, this book is suitable for both introductory and more advanced courses in functional analysis. Including over 1500 exercises of varying difficulty and various motivational and historical remarks, the book can be used for self-study and alongside lecture courses.

Functional Analysis-George Bachman 2012-09-26 Text covers introduction to inner-product spaces, normed, metric spaces, and topological spaces; complete orthonormal sets, the Hahn-Banach Theorem and its consequences, and many other related subjects. 1966 edition.

Applied Functional Analysis-Eberhard Zeidler 1999-08-13 The first part of a self-contained, elementary textbook, combining linear functional analysis, nonlinear functional analysis, numerical functional analysis, and their substantial

applications with each other. As such, the book addresses undergraduate students and beginning graduate students of mathematics, physics, and engineering who want to learn how functional analysis elegantly solves mathematical problems which relate to our real world. Applications concern ordinary and partial differential equations, the method of finite elements, integral equations, special functions, both the Schroedinger approach and the Feynman approach to quantum physics, and quantum statistics. As a prerequisite, readers should be familiar with some basic facts of calculus. The second part has been published under the title, Applied Functional Analysis: Main Principles and Their Applications.

Beginning Functional Analysis-Karen Saxe 2001-12-07 The unifying approach of functional analysis is to view functions as points in abstract vector space and the differential and integral operators as linear transformations on these spaces. The author's goal is to present the basics of functional analysis in a way that makes them comprehensible to a student who has completed courses in linear algebra and real analysis, and to develop the topics in their historical contexts.

Applied Functional Analysis-D.H. Griffel 2012-04-26 This introductory text examines applications of functional analysis to mechanics, fluid mechanics, diffusive growth, and approximation. Covers distribution theory, Banach spaces, Hilbert space, spectral theory, Frechet calculus, Sobolev spaces, more. 1985 edition.

Functional Analysis in Applied Mathematics and Engineering-Michael Pedersen 1999-09-29 Presenting excellent material for a first course on functional analysis , Functional Analysis in Applied Mathematics and Engineering concentrates on material that will be useful to control engineers from the disciplines of electrical, mechanical, and aerospace engineering. This text/reference discusses: rudimentary topology Banach's fixed point theorem with applications L^p-spaces density theorems for testfunctions infinite dimensional spaces bounded linear operators Fourier series open mapping and closed graph theorems compact and differential operators Hilbert-Schmidt operators Volterra equations Sobolev spaces control theory and variational analysis Hilbert Uniqueness Method boundary element methods Functional Analysis in Applied Mathematics and Engineering begins with an introduction to the important, abstract basic function spaces and operators with mathematical rigor, then studies problems in the Hilbert space setting. The author proves the spectral theorem for unbounded operators with compact inverses and goes on to present the abstract evolution semigroup theory for time dependent linear partial differential operators. This structure establishes a firm foundation for the more advanced topics discussed later in the text.

Functional Analysis-James T. Chok 2019-09-18 Functional Analysis: A Practitioner's Guide to Implementation and Training provides practitioners with the most updated information about applying the wide span of current functional analysis (FA) methodologies geared specifically to applied service settings. The book serves as a self-instructional implementation to a broad-base of trainees and care-providers within schools, clinics, centers and human services organizations. Adopting a Behavioral Skills Training and competency-based training outcomes approach, the learning materials and activities featured in the book include suggested slideshow presentations, role-play exercises, pre- and post-training quizzes, natural setting evaluation methods, data recording forms, instructional scripts and reproducible handouts. Covers an historical overview and the ethical considerations of functional analysis Examines FA methodology, measurement methods and experimental designs Teaches how to independently design, conduct and interpret FAs Explains how to formulate FA-informed intervention plans Presents an agile curriculum that can be customized for different providers

An Introduction to Stochastic Differential Equations-Lawrence C. Evans 2012-12-11 These notes provide a concise introduction to stochastic differential equations and their application to the study of financial markets and as a basis for modeling diverse physical phenomena. They are accessible to non-specialists and make a valuable addition to the collection of texts on the topic. --Srinivasa Varadhan, New York University This is a handy and very useful text for studying stochastic differential equations. There is enough mathematical detail so that the reader can benefit from this introduction with only a basic background in mathematical analysis and probability. --George Papanicolaou, Stanford University This book covers the most important elementary facts regarding stochastic differential equations; it also describes some of the applications to partial differential equations, optimal stopping, and options pricing. The book's style is intuitive rather than formal, and emphasis is made on clarity. This book will be very helpful to starting graduate students and strong undergraduates as well as to others who want to gain knowledge of stochastic differential equations. I recommend this book enthusiastically. --Alexander Lipton, Mathematical Finance Executive, Bank of America Merrill Lynch This short book provides a quick, but very readable introduction to stochastic differential equations, that is, to differential equations subject to additive ``white noise'' and related random disturbances. The exposition is concise and strongly focused upon the interplay between probabilistic intuition and mathematical rigor. Topics include a quick survey of measure theoretic probability theory, followed by an introduction to Brownian motion and the Ito stochastic calculus, and finally the theory of stochastic differential equations. The text also includes applications to partial differential equations, optimal stopping problems and options pricing. This book can be used as a text for senior undergraduates or beginning graduate students in mathematics, applied mathematics, physics, financial mathematics, etc., who want to learn the basics of stochastic differential equations. The reader is assumed to be fairly familiar with measure theoretic mathematical analysis, but is not assumed to have any particular knowledge of probability theory (which is rapidly developed in Chapter 2 of the book).

Linear Functional Analysis-Bryan Rynne 2013-03-14 This book provides an introduction to the ideas and methods of linear func tional analysis at a level appropriate to the final year of an undergraduate course at a British university. The prerequisites for reading it are a standard undergraduate knowledge of linear algebra and real analysis (including the the ory of metric spaces). Part of the development of functional analysis can be traced to attempts to find a suitable framework in which to discuss differential and integral equa tions. Often, the appropriate setting turned out to be a vector space of real or complex-valued functions defined on some set. In general, such a vector space is infinite-dimensional. This leads to difficulties in that, although many of the elementary properties of finite-dimensional vector spaces hold in infinite dimensional vector spaces, many others do not. For example, in general infinite dimensional vector spaces there is no framework in which to make sense of an alytic concepts such as convergence and continuity. Nevertheless, on the spaces of most interest to us there is often a norm (which extends the idea of the length of a vector to a somewhat more abstract setting). Since a norm on a vector space gives rise to a metric on the space, it is now possible to do analysis in the space. As real or complex-valued functions are often called functionals, the term functional analysis came to be used for this topic. We now briefly outline the contents of the book.

Introduction to Measure Theory and Functional Analysis-Piermarco Cannarsa 2015-07-15 This book introduces readers to theories that play a crucial role in modern mathematics, such as integration and functional analysis, employing a unifying approach that views these two subjects as being deeply intertwined. This feature is particularly evident in the broad range of problems examined, the solutions of which are often supported by generous hints. If the material is split into two courses, it can be supplemented by additional topics from the third part of the book, such as functions of bounded variation, absolutely continuous functions, and signed measures. This textbook addresses the needs of graduate students in mathematics, who will find the basic material they will need in their future careers, as well as those of researchers, who will appreciate the self-contained exposition which requires no other preliminaries than basic calculus and linear algebra.

Functional Analysis-Theo Bühler 2018-08-08 It begins in Chapter 1 with an introduction to the necessary foundations, including the Arzelà–Ascoli theorem, elementary Hilbert space theory, and the Baire Category Theorem. Chapter 2 develops the three fundamental principles of functional analysis (uniform boundedness, open mapping theorem, Hahn–Banach theorem) and discusses reflexive spaces and the James space. Chapter 3 introduces the weak and weak topologies and includes the theorems of Banach–Alaoglu, Banach–Dieudonné, Eberlein–Šmulyan, Kre&ibreve;n–Milman, as well as an introduction to topological vector spaces and applications to ergodic theory. Chapter 4 is devoted to Fredholm theory. It includes an introduction to the dual operator and to compact operators, and it establishes the closed image theorem. Chapter 5 deals with the spectral theory of bounded linear operators. It introduces complex Banach and Hilbert spaces, the continuous functional calculus for self-adjoint and normal operators, the Gelfand spectrum, spectral measures, cyclic vectors, and the spectral theorem. Chapter 6 introduces unbounded operators and their duals. It establishes the closed image theorem in this setting and extends the functional calculus and spectral measure to unbounded self-adjoint operators on Hilbert spaces. Chapter 7 gives an introduction to strongly continuous semigroups and their infinitesimal generators. It includes foundational results about the dual semigroup and analytic semigroups, an exposition of measurable functions with values in a Banach space, and a discussion of solutions to the inhomogeneous equation and their regularity properties. The appendix establishes the equivalence of the Lemma of Zorn and the Axiom of Choice, and it contains a proof of Tychonoff's theorem. With 10 to 20 elaborate exercises at the end of each chapter, this book can be used as a text for a one-or-two-semester course on functional analysis for beginning graduate students. Prerequisites are first-year analysis and linear algebra, as well as some foundational material from the second-year courses on point set topology, complex analysis in one variable, and measure and integration.

Functional Analysis-Nino Boccara 1990-10-25 Based on a third-year course for French students of physics, this book is a graduate text in functional analysis emphasizing applications to physics. It introduces Lebesgue integration, Fourier and Laplace transforms, Hilbert space theory, theory of distribution a la Laurent Schwartz, linear operators, and spectral theory. It contains numerous examples and completely worked out exercises.

Functional Analysis-Vagn Lundsgaard Hansen 2015-12-01 This book presents basic elements of the theory of Hilbert spaces and operators on Hilbert spaces, culminating in a proof of the spectral theorem for compact, self-adjoint operators on separable Hilbert spaces. It exhibits a construction of the space of pth power Lebesgue integrable functions by a completion procedure with respect to a suitable norm in a space of continuous functions, including proofs of the basic inequalities of Hölder and Minkowski. The Lp-spaces thereby emerges in direct analogy with a construction of the real numbers from the rational numbers. This allows grasping the main ideas more rapidly. Other important Banach spaces arising from function spaces and sequence spaces are also treated. In this second edition, I have expanded the material on normed vector spaces and their operators presented in Chapter 1 to include proofs of the Open Mapping Theorem, the Closed Graph Theorem and the Hahn–Banach Theorem. The material on operators between normed vector spaces is further expanded in a new Chapter 6, which presents the basic elements of the theory of Fredholm operators on general Banach spaces, not only on Hilbert spaces. This requires that we develop the theory of dual operators between Banach spaces to replace the use of adjoint operators between Hilbert spaces. With the addition of the new material on normed vector spaces and their operators, the book can serve as a general introduction to functional analysis viewed as a theory of infinite dimensional linear spaces and linear operators acting on them.
Answer Booklet Introductory Functional Analysis with Application-Erwin Kreyszig 1978-01-01
Applied Functional Analysis-Jean-Pierre Aubin 2011-09-30 A novel, practical introduction to functional analysis In the twenty years since the first edition of Applied FunctionalAnalysis was published, there has been an explosion in the numberof books on functional analysis. Yet none of these offers theunique perspective of this new edition. Jean-Pierre Aubin updateshis popular reference on functional analysis with new insights andrecent discoveries-adding three new chapters on set-valued analysisand convex analysis, viability kernels and capture basins, andfirst-order partial differential equations. He presents, for thefirst time at an introductory level, the extension of differentialcalculus in the framework of both the theory of distributions andset-valued analysis, and discusses their application for studyingboundary-value problems for elliptic and parabolic partialdifferential equations and for systems of first-order partialdifferential equations. To keep the presentation concise and accessible, Jean-Pierre Aubinintroduces functional analysis through the simple Hilbertianstructure. He seamlessly blends pure mathematics with applied areasthat illustrate the theory, incorporating a broad range of examplesfrom numerical analysis, systems theory, calculus of variations,control and optimization theory, convex and nonsmooth analysis, andmore. Finally, a summary of the essential theorems as well asexercises reinforcing key concepts are provided. Applied FunctionalAnalysis, Second Edition is an excellent and timely resource forboth pure and applied mathematicians.
Introduction to Functional Data Analysis-Piotr Kokoszka 2017-09-27 Introduction to Functional Data Analysis provides a concise textbook introduction to the field. It explains how to analyze functional data, both at exploratory and inferential levels. It also provides a systematic and accessible exposition of the methodology and the required mathematical framework. The book can be used as textbook for a semester-long course on FDA for advanced undergraduate or MS statistics majors, as well as for MS and PhD students in other disciplines, including applied mathematics, environmental science, public health, medical research, geophysical sciences and economics. It can also be used for self-study and as a reference for researchers in those fields who wish to acquire solid understanding of FDA methodology and practical guidance for its implementation. Each chapter contains plentiful examples of relevant R code and theoretical and data analytic problems. The material of the book can be roughly divided into four parts of approximately equal length: 1) basic concepts and techniques of FDA, 2) functional regression models, 3) sparse and dependent functional data, and 4) introduction to the Hilbert space framework of FDA. The book assumes advanced undergraduate background in calculus, linear algebra, distributional probability theory, foundations of statistical inference, and some familiarity with R programming. Other required statistics background is provided in scalar settings before the related functional concepts are developed. Most chapters end with references to more advanced research for those who wish to gain a more in-depth understanding of a specific topic.
Theoretical Foundations of Functional Data Analysis, with an Introduction to Linear Operators-Tailen Hsing 2015-05-06 Theoretical Foundations of Functional Data Analysis, with an Introduction to Linear Operators provides a uniquely broad compendium of the key mathematical concepts and results that are relevant for the theoretical development of functional data analysis (FDA). The self–contained treatment of selected topics of functional analysis and operator theory includes reproducing kernel Hilbert spaces, singular value decomposition of compact operators on Hilbert spaces and perturbation theory for both self–adjoint and non self–adjoint operators. The probabilistic foundation for FDA is described from the perspective of random elements in Hilbert spaces as well as from the viewpoint of continuous time stochastic processes. Nonparametric estimation approaches including kernel and regularized smoothing are also introduced. These tools are then used to investigate the properties of estimators for the mean element, covariance operators, principal components, regression function and canonical correlations. A general treatment of canonical correlations in Hilbert spaces naturally leads to FDA formulations of factor analysis, regression, MANOVA and discriminant analysis. This book will provide a valuable reference for statisticians and other researchers interested in developing or understanding the mathematical aspects of FDA. It is also suitable for a graduate level special topics course.

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