Distribution Theory And Transform Analysis An Introduction To Generalized Functions With Applications A H Zemanian

SHELTON KEELY

A Guide to Distribution Theory and Fourier Transforms Bentham Science Publishers
The aim of this comparatively short textbook is a sufficiently full exposition of the fundamentals of the theory of functions of a complex variable to prepare the student for various applications. Several important applications in physics and engineering are considered in the book. This thorough presentation includes all theorems (with a few exceptions) presented with proofs. No previous exposure to complex numbers is assumed. The textbook can be used in one-semester or two-semester courses. In one respect this book is larger than usual, namely in the number of detailed solutions of typical problems. This, together with various problems, makes the book useful both for self- study and for the instructor as well. A specific point of the book is the inclusion of the Laplace transform. These two topics are closely related. Concepts in complex analysis are needed to formulate and prove basic theorems in Laplace transforms, such as the inverse Laplace transform formula. Methods of complex analysis provide solutions for problems involving Laplace transforms. Complex numbers lend clarity and completion to some areas of classical analysis. These numbers found important applications not only in the mathematical theory, but in the mathematical descriptions of processes in physics and engineering.

Convolution, Fourier Transform, and Laplace Transform Routledge
Distributions in the Physical and Engineering Sciences is a comprehensive exposition on analytic methods for solving science and engineering problems which is written from the unifying viewpoint of distribution theory and enriched with many

modern topics which are important to practitioners and researchers. The goal of the book is to give the reader, specialist and non-specialist usable and modern mathematical tools in their research and analysis. This new text is intended for graduate students and researchers in applied mathematics, physical sciences and engineering. The careful explanations, accessible writing style, and many illustrations/examples also make it suitable for use as a self-study reference by anyone seeking greater understanding and proficiency in the problem solving methods presented. The book is ideal for a general scientific and engineering audience, yet it is mathematically precise. The present, softcover reprint is designed to make this classic textbook available to a wider audience.

Distribution theory and transform analysis Springer Science & Business Media

Learn the basics of white noise theory with White Noise Distribution Theory. This book covers the mathematical foundation and key applications of white noise theory without requiring advanced knowledge in this area. This instructive text specifically focuses on relevant application topics such as integral kernel operators, Fourier transforms, Laplacian operators, white noise integration, Feynman integrals, and positive generalized functions. Extremely well-written by one of the field's leading researchers, White Noise Distribution Theory is destined to become the definitive introductory resource on this challenging topic.

Distributions Springer Science & Business Media

A self-contained introduction to discrete harmonic analysis with an emphasis on the Discrete and Fast Fourier Transforms.

Distributional and Fractal Calculus, Integral Transforms and Wavelets CRC Press

Rigorous and concise, this text examines the basis of the distribution theories devised by Schwartz and by Mikusinki and surveys both functional and algebraic theories of distribution. 1962 edition.

White Noise Distribution Theory Distribution Theory and Transform AnalysisAn Introduction to Generalized Functions, with Applications

This book is tailored to fulfil the requirements in the area of the signal processing in communication systems. The book contains numerous examples, solved problems and exercises to explain the methodology of Fourier Series, Fourier Analysis, Fourier Transform and properties, Fast Fourier Transform FFT, Discrete Fourier Transform DFT and properties, Discrete Cosine Transform DCT, Discrete Wavelet Transform DWT and Contourlet Transform CT. The book is characterized by three directions, the communication theory and signal processing point of view, the mathematical point of view and utility computer programs. The contents of this book include chapters in communication system and signals, Fourier Series and Power Spectra, Fourier Transform and Energy Spectra, Fourier Transform and Power Spectra, Correlation Function and Spectral Density, Signal Transmission and Systems, Hilbert Transform, Narrow Band-Pass Signals and Systems and Numerical Computation of Transform Coding. This book is intended for undergraduate students in institutes, colleges, universities and academies who want to specialize in the field of communication systems and signal processing. The book will also be very useful to engineers of graduate and post graduate studies as well as researchers in research centers since it contains a great number of mathematical operations that are considered important in research results.

The Fourier Transform and Its Applications Springer Science & Business Media

This book presents important contributions to modern theories concerning the distribution theory applied to convex analysis (convex functions, functions of lower semicontinuity, the subdifferential of a convex function). The authors prove several basic results in distribution theory and present ordinary differential equations and partial differential equations by providing generalized solutions. In addition, the book deals with Sobolev spaces, which presents aspects related to variation problems, such as the Stokes system, the elasticity system and the plate equation. The authors also include approximate formulations of variation problems, such as the Galerkin method or the finite element method. The book is accessible to all scientists, and it is especially useful for those who use mathematics to solve engineering and physics problems. The authors have avoided concepts and results contained in other books in order to keep the book comprehensive. Furthermore, they do not present concrete simplified models and pay maximal attention to scientific rigor.

Performance Analysis of Standard Fourier-Transform Spectrometers. Springer

A new characterization of the Laplace transform is developed which extends the transform to the Schwartz distributions. The class of distributions includes, in addition to all ordinary functions, the impulse functions and other singular functions which occur as solutions to ordinary and partial differential equations. The standard theorems on analyticity, uniqueness, and invertibility of the transform are proved by using the new characterization as the definition of the Laplace transform. The new definition uses sequences of linear transformations on the space of distributions in a manner suggested by a paper of E. Gesztelyi which extended the Laplace transform to another class of generalized functions, the Mikusinski operators. It is shown that the new sequential definition of the transform is equivalent to Schwartz' extension of the ordinary Laplace transform to distributions but, in contrast to Schwartz' definition, does not use the distributional Fourier transform. Several theorems concerning the particular linear transformations used to define the Laplace transforms are proved. All the results proved in one dimension are extended to the n-dimensional case, but proofs are presented only for those situations that require methods different from their one-dimensional analogs.

John Wiley & Sons

This book provides a modern and up-to-date treatment of the Hilberttransform of distributions and the space of periodic distributions.Taking a simple and effective approach to a complex subject, thisvolume is a first-rate textbook at the graduate level as well as anextremely useful reference for mathematicians, applied scientists,and engineers. The author, a leading authority in the field, shares with thereader many new results from his exhaustive research on the Hilberttransform of Schwartz distributions. He describes in detail how touse the Hilbert transform to solve theoretical and physicalproblems in a wide range of disciplines; these include aerofoilproblems, dispersion relations, high-energy physics, potentialtheory problems, and others. Innovative at every step, J. N. Pandey provides a new definitionfor the Hilbert transform of periodic functions, which isespecially useful for those working in the area of signalprocessing for computational purposes. This definition could alsoform the basis for a unified theory of the Hilbert transform ofperiodic, as well as nonperiodic, functions. The Hilbert transform and the approximate Hilbert transform ofperiodic functions are worked out in detail for the first time inbook form and can be used to solve Laplace's equation with periodicboundary conditions. Among the many theoretical results proved inthis book is a Paley-Wiener type theorem giving thecharacterization of functions and generalized functions whoseFourier transforms are supported in certain orthants of Rn.

Placing a strong emphasis on easy application of theory andtechniques, the book generalizes the Hilbert problem in higherdimensions and solves it in function spaces as well as ingeneralized function spaces. It simplifies the one-dimensionaltransform of distributions; provides solutions to thedistributional Hilbert problems and singular integral equations;and covers the intrinsic definition of the testing function spacesand its topology. The book includes exercises and review material for all majortopics, and incorporates classical and distributional problems intothe main text. Thorough and accessible, it explores new ways to usethis important integral transform, and reinforces its value in bothmathematical research and applied science. The Hilbert transform made accessible with many new formulas anddefinitions Written by today's foremost expert on the Hilbert transform ofgeneralized functions, this combined text and reference covers theHilbert transform of distributions and the space of periodicdistributions. The author provides a consistently accessibletreatment of this advanced-level subject and teaches techniquesthat can be easily applied to theoretical and physical problemsencountered by mathematicians, applied scientists, and graduatestudents in mathematics and engineering. Introducing many new inversion formulas that have been developedand applied by the author and his research associates, the book: * Provides solutions to the distributional Hilbert problem andsingular integral equations * Focuses on the Hilbert transform of Schwartz distributions,giving intrinsic definitions of the space H(D) and its topology * Covers the Paley-Wiener theorem and provides many importanttheoretical results of importance to research mathematicians * Provides the characterization of functions and generalizedfunctions whose Fourier transforms are supported in certainorthants of Rn * Offers a new definition of the Hilbert transform of the periodicfunction that can be used for computational purposes in signalprocessing * Develops the theory of the Hilbert transform of periodicdistributions and the approximate Hilbert transform of periodicdistributions * Provides exercises at the end of each chapter--useful toprofessors in planning assignments, tests, and problems

Complex Variables and the Laplace Transform for Engineers CRC Press

The wavelet transform has emerged as one of the most promising function transforms with great potential in applications during the last four decades. The present monograph is an outcome of the recent researches by the author and his co-workers, most of which are not available in a book form. Nevertheless, it also contains the results of many other celebrated workers of the ?eld. The aim of the book is to enrich the theory of the wavelet transform and to provide new directions for further research in theory and applications of the wavelet transform. The book does not contain any sophisticated Mathematics. It is intended for graduate students of Mathematics, Physics and Engineering sciences, as well as interested researchers from other ?elds. The Fourier transform has wide applications in Pure and Applied Mathematics, Physics and Engineering sciences; but sometimes one has to make compromise with the results obtainedbytheFouriertransformwiththephysicalintuitions. ThereasonisthattheFourier transform does not re?ect the evolution over time of the (physical) spectrum and thus it contains no local information. The continuous wavelet transform (W f)(b,a), involving ? wavelet ?, translation parameterb and dilation parametera, overcomes these drawbacks of the Fourier transform by representing signals (time dependent functions) in the phase space (time/frequency) plane with a local frequency resolution. The Fourier transform is p n restricted to the domain L (R) with 1 p 2, whereas the wavelet transform can be de?ned for 1 p

The Hilbert Transform of Schwartz Distributions and Applications American Mathematical Soc.

Provides basic ideas and results of distribution theory and its applications to Fourier analysis and partial differential equations. Examples are provided to illustrate the concepts; exercises of various level of difficulty are given. Important topics covered like basic properties of distributions, convolution, Fourier transforms, Sobolev spaces, weak solutions, distributions on locally convex spaces and on differentiable manifolds.

Fourier Series, Fourier Transform and Their Applications to Mathematical Physics World Scientific

For those who have a background in advanced calculus, elementary topology and functional analysis - from applied mathematicians and engineers to physicists - researchers and graduate students alike - this work provides a comprehensive analysis of the many important integral transforms and renders particular attention to all of the technical aspects of the subject. The author presents the last two decades of research and includes important results from other works.

An Introduction to the Laplace Transform and the Z Transform Springer

The theory of distributions has numerous applications and is extensively used in mathematics, physics and engineering. There is however relatively little elementary expository literature on distribution theory. This book is intended as an introduction. Starting with the elementary theory of distributions, it proceeds to convolution products of distributions, Fourier and Laplace transforms, tempered distributions, summable distributions and applications. The theory is illustrated by several examples, mostly beginning with the case of the real line and then followed by examples in higher dimensions. This is a justified and practical approach, it helps the reader to become familiar with the subject. A moderate number of exercises are added. It is suitable for a one-semester course at the advanced undergraduate or beginning graduatelevelor for self-study.

Periodic Functions and Distributions, Complex Analysis, Laplace Transform and Applications World Scientific

Once upon a time students of mathematics and students of science or engineering took the same courses in mathematical analysis beyond calculus. Now it is common to separate" advanced mathematics for science and engi neering" from what might be called "advanced mathematical analysis for mathematicians." It seems to me both useful and timely to attempt a reconciliation. The separation between kinds of courses has unhealthy effects. Mathe matics students reverse the historical development of analysis, learning the unifying abstractions first and the examples later (if ever). Science students learn the examples as taught generations ago, missing modern insights. A choice between encountering Fourier series as a minor instance of the repre sentation theory of Banach algebras, and encountering Fourier series in isolation and developed in an ad hoc manner, is no choice at all. It is easy to recognize these problems, but less easy to counter the legiti mate pressures which have led to a separation. Modern mathematics has broadened our perspectives by abstraction and bold generalization, while developing techniques which can treat classical theories in a definitive way. On the other hand, the applier of mathematics has continued to need a variety of definite tools and has not had the time to acquire the broadest and most definitive grasp-to learn necessary and sufficient conditions when simple sufficient conditions will serve, or to learn the general framework encompass ing different examples.

Distribution Theory and Transform Analysis Courier Corporation

This is the first text in a generation to re-examine the purpose of

the mathematical statistics course. The book's approach interweaves traditional topics with data analysis and reflects the use of the computer with close ties to the practice of statistics. The author stresses analysis of data, examines real problems with real data, and motivates the theory. The book's descriptive statistics, graphical displays, and realistic applications stand in strong contrast to traditional texts that are set in abstract settings. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

Distribution Theory Graduate Texts in Mathematics
Distribution theory, a relatively recent mathematical approach to classical Fourier analysis, not only opened up new areas of research but also helped promote the development of such mathematical disciplines as ordinary and partial differential equations, operational calculus, transformation theory, and functional analysis. This text was one of the first to give a clear explanation of distribution theory; it combines the theory effectively with extensive practical applications to science and engineering problems. Based on a graduate course given at the State University of New York at Stony Brook, this book has two objectives: to provide a comparatively elementary introduction to distribution theory and to describe the generalized Fourier and Laplace transformations and their applications to integrodifferential equations, difference equations, and passive systems. After an introductory chapter defining distributions and the operations that apply to them, Chapter 2 considers the calculus of distributions, especially limits, differentiation, integrations, and the interchange of limiting processes. Some deeper properties of distributions, such as their local character as derivatives of continuous functions, are given in Chapter 3. Chapter 4 introduces the distributions of slow growth, which arise naturally in the generalization of the Fourier transformation. Chapters 5 and 6 cover the convolution process and its use in representing differential and difference equations. The distributional Fourier and Laplace transformations are developed in Chapters 7 and 8, and the latter transformation is applied in Chapter 9 to obtain an operational calculus for the solution of differential and difference equations of the initial-condition type. Some of the previous theory is applied in Chapter 10 to a discussion of the fundamental properties of certain physical systems, while Chapter 11 ends the book with a consideration of periodic distributions. Suitable for a graduate course for engineering and science students or for a senior-level undergraduate course for mathematics majors, this book presumes a knowledge of advanced calculus and the standard theorems on the interchange of limit processes. A broad spectrum of problems has been included to satisfy the diverse needs of various types of students.

Distributions in the Physical and Engineering Sciences, Volume 1 Cambridge University Press
Acclaimed text on engineering math for graduate students covers theory of complex variables, Cauchy-Riemann equations, Fourier and Laplace transform theory, Z-transform, and much more. Many excellent problems.

Distributions John Wiley & Sons
The present Learned Research Work is an exhaustive survey and researches carried out by the authors, which led to the theories of distributions, generalized functions and transforms involving them, which includes interesting results and the fundamental concepts of the youngest generalization of Schwartz theory of distributions, the Boehmians. The tempered distribution and utilizations have been described, which provide suitable platforms for the generalizations of Fourier transforms, Stieltjes and Mellin transforms. To overcome the Fourier series this work includes wavelet transform, for which meticulous extensive study of the existing literature has been produced including recent researches carried out by the authors. This compilation, in the form of the present book, is believed to be of help to researchers in the field of distribution and transform analysis and, may even be treated as the reference book to post graduate students.

Music: A Mathematical Offering Springer Nature
Algorithms for line finding, fitting spectra to voigtian profiles, filtering, Fourier transforming, and spectrum synthesis are a basis for spectrum analysis tools from which complex signal-processing procedures can be constructed.".

Independent Component Analysis Springer
Distribution Theory and Transform AnalysisAn Introduction to Generalized Functions, with ApplicationsCourier Corporation

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