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

Distribution Theory And Transform Analysis An Introduction To Generalized Functions With Applications A H Zemanian | 00414e408e0bd8147a7c284e100b6662

This authoritative text studies pseudodifferential and Fourier integral operators in the framework of time-frequency analysis, providing an elementary approach, along with applications to almost diagonalization of such operators and to the sparsity of their Gabor representations. Moreover, Gabor frames and modulation spaces are employed to study dispersive equations such as the Schrödinger, wave, and heat equations and related Strichartz problems. The first part of the book is addressed to non-experts, presenting the basics of time-frequency analysis: short time Fourier transform, Wigner distribution and other representations, function spaces and frames theory, and it can be read independently as a short text-book on this topic from graduate and under-graduate students, or scholars in other disciplines.Hermitian Analysis: From Fourier Series to Cauchy-Riemann Geometry provides a coherent, integrated look at various topics from undergraduate analysis. It begins with Fourier series, continues with Hilbert spaces, discusses the Fourier transform on the real line, and then turns to the heart of the book, geometric considerations. This chapter includes complex differential forms, geometric inequalities from one and several complex variables, and includes some of the author's results. The concept of orthogonality weaves the material into a coherent whole. This textbook will be a useful resource for upper-undergraduate students who intend to continue with mathematics, graduate students interested in analysis, and researchers interested in some basic aspects of CR Geometry. The inclusion of several hundred exercises makes this book suitable for a capstone undergraduate Honors class. This reference/text describes the basic elements of the integral, finite, and discrete transforms - emphasizing their use for solving boundary and initial value problems as well as facilitating the representations of signals and systems.;Proceeding to the final
solution in the same setting of Fourier analysis without interruption, Integral and Discrete Transforms with Applications and Error Analysis: presents the background of the FFT and explains how to choose the appropriate transform for solving a boundary value problem; discusses modelling of the basic partial differential equations, as well as the solutions in terms of the main special functions; considers the Laplace, Fourier, and Hankel transforms and their variations, offering a more logical continuation of the operational method; covers integral, discrete, and finite transforms and trigonometric Fourier and general orthogonal series expansion, providing an application to signal analysis and boundary-value problems; and examines the practical approximation of computing the resulting Fourier series or integral representation of the final solution and treats the errors incurred. Containing many detailed examples and numerous end-of-chapter exercises of varying difficulty for each section with answers, Integral and Discrete Transforms with Applications and Error Analysis is a thorough reference for analysts; industrial and applied mathematicians; electrical, electronics, and other engineers; and physicists and an informative text for upper-level undergraduate and graduate students in these disciplines. 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 engineering" 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. Mathematics 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 representation 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 legitimate 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 encompassing different examples. 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 field. 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 fields. 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 obtained by the Fourier transform with the physical intuitions. There reason that the Fourier transform does not reflect the evolution over time of the (physical) spectrum and thus it contains no local information. The continuous wavelet transform \( (\mathcal{W} f)(b,a) \), involving \( ? \) wavelet \( ? \), translation parameter \( b \) and dilation parameter \( a \), 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 \( \mathbb{L}(\mathbb{R}) \) with \( 1 \leq p \leq 2 \), whereas the wavelet transform can be de?ned for 1 pDistribution 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,
Where To Download Distribution Theory And Transform Analysis An
Introduction To Generalized Functions With Applications A H Zemanian

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
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. This textbook is an application-oriented introduction to the theory of distributions, a powerful tool used in
mathematical analysis. The treatment emphasizes applications that relate distributions to linear partial differential equations and Fourier analysis
problems found in mechanics, optics, quantum mechanics, quantum field theory, and signal analysis. The book is motivated by many exercises,
hints, and solutions that guide the reader along a path requiring only a minimal mathematical background. This book provides a modern and up-
to-date treatment of the Hilbert transform of distributions and the space of periodic distributions. Taking a simple and effective approach to a
complex subject, this volume is a first-rate textbook at the graduate level as well as an extremely useful reference for mathematicians, applied
scientists, and engineers. The author, a leading authority in the field, shares with the reader many new results from his exhaustive research on
the Hilbert transform of Schwartz distributions. He describes in detail how to use the Hilbert transform to solve theoretical and physical problems
in a wide range of disciplines; these include aerofoil problems, dispersion relations, high-energy physics, potential theory problems, and others.
Innovative at every step, J. N. Pandey provides a new definition for the Hilbert transform of periodic functions, which is especially useful for those
working in the area of signal-processing for computational purposes. This definition could also form the basis for a unified theory of the Hilbert
transform of periodic, as well as nonperiodic, functions. The Hilbert transform and the approximate Hilbert transform of periodic functions are
worked out in detail for the first time in book form and can be used to solve Laplace's equation with periodic boundary conditions. Among the
many theoretical results proved in this book is a Paley-Wiener type theorem giving the characterization of functions and generalized functions
whose Fourier transforms are supported in certain orthants of R^n. Placing a strong emphasis on easy application of theory and techniques, the
book generalizes the Hilbert problem in higher dimensions and solves it in function spaces as well as in generalized function spaces. It simplifies
the one-dimensional transform of distributions; provides solutions to the distributional Hilbert problems and singular integral equations; and covers
the intrinsic definition of the testing function spaces and its topology. The book includes exercises and review material for all major topics, and
incorporates classical and distributional problems into the main text. Thorough and accessible, it explores new ways to use this important integral
Where To Download Distribution Theory And Transform Analysis An Introduction To Generalized Functions With Applications A H Zemanian

transform, and reinforces its value in both mathematical research and applied science. The Hilbert transform made accessible with many new formulas and definitions. Written by today’s foremost expert on the Hilbert transform of generalized functions, this combined text and reference covers the Hilbert transform of distributions and the space of periodic distributions. The author provides a consistently accessible treatment of this advanced-level subject and teaches techniques that can be easily applied to theoretical and physical problems encountered by mathematicians, applied scientists, and graduate students in mathematics and engineering. Introducing many new inversion formulas that have been developed and applied by the author and his research associates, the book: 
* Provides solutions to the distributional Hilbert problem and singular 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 important theoretical results of importance to research mathematicians 
* Provides the characterization of functions and generalized functions whose Fourier transforms are supported in certain orthants of $R^n$ 
* Offers a new definition of the Hilbert transform of the periodic function that can be used for computational purposes in signal processing 
* Develops the theory of the Hilbert transform of periodic distributions and the approximate Hilbert transform of periodic distributions 
* Provides exercises at the end of each chapter--useful to professors in planning assignments, tests, and problems

This important book provides a concise exposition of the basic ideas of the theory of distribution and Fourier transforms and its application to partial differential equations. The author clearly presents the ideas, precise statements of theorems, and explanations of ideas behind the proofs. Methods in which techniques are used in applications are illustrated, and many problems are included. The book also introduces several significant recent topics, including pseudodifferential operators, wave front sets, wavelets, and quasicrystals. Background mathematical prerequisites have been kept to a minimum, with only a knowledge of multidimensional calculus and basic complex variables needed to fully understand the concepts in the book.

A Guide to Distribution Theory and Fourier Transforms can serve as a textbook for parts of a course on Applied Analysis or Methods of Mathematical Physics, and in fact it is used that way at Cornell. The basics of what every scientist and engineer should know, from complex numbers, limits in the complex plane, and complex functions to Cauchy’s theory, power series, and applications of residues. 1974 edition. This book gives an introduction to distribution theory, based on the work of Schwartz and of many other people. It is the first book to present distribution theory as a standard text. Each chapter has been enhanced with many exercises and examples. The main change in this edition is the inclusion of exercises with answers and hints. This is meant to emphasize that this volume has been written as a general course in modern analysis on a graduate student level and not only as the beginning of a specialized course in partial differential equations. In particular, it could also serve as an introduction to harmonic analysis. Exercises are given primarily to the sections of general interest; there are none to the last two chapters. Most of the exercises are just routine problems meant to give some familiarity with standard use of the tools introduced in the text. Others are extensions of the theory presented there. As a rule rather complete though brief solutions are then given in the answers and hints. To a large extent the exercises have been taken over from courses or examinations given by Anders Melin or myself at the University of Lund. I am grateful to Anders Melin for letting me use the problems originating from him and for numerous valuable comments on this collection. As in the revised printing of Volume II, a number of minor flaws have also been corrected in this edition. Many of these have been called to my attention by the Russian translators of the first edition, and I wish to thank them for our excellent collaboration. An introduction to transform theory. 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. While social scientists and historians have been exchanging ideas for a long time, they have never developed a proper dialogue about social theory. William H. Sewell Jr. observes that on questions of theory the communication has been mostly one way: from social science to history. Logics of History argues that both history and the social sciences have something crucial to offer each other. While historians do not think of themselves as theorists, they know something social scientists do not: how to think about the temporalities of social life. On the other hand, while social scientists’ treatments of temporality are usually clumsy, their theoretical sophistication and penchant for structural accounts of social life could offer much to historians. Renowned for his work at the crossroads of history, sociology, political science, and anthropology, Sewell argues that only by combining a more sophisticated understanding of historical time with a concern for larger theoretical questions can a satisfying social theory emerge. In Logics of History, he reveals the shape such an engagement could take, some of the topics it could illuminate, and how it might affect both sides of the disciplinary divide. This book explains the state of the art in the use of the discrete Fourier transform (DFT) of musical structures such as rhythms or scales. In particular the author explains the DFT of pitch-class distributions, homometry and the phase retrieval problem, nil Fourier coefficients and tilings, saliency, extrapolation to the continuous Fourier transform and continuous spaces, and the meaning of the phases of Fourier coefficients. This is the first textbook dedicated to this subject, and with supporting examples and exercises this is suitable for researchers and advanced undergraduate and graduate students of music, computer science and engineering. The author has made online supplementary material available, and the book is also suitable for practitioners who want to learn about techniques for understanding musical notions and who want to gain musical insights into mathematical problems. This is a substantially updated, extended and reorganized third edition of an introductory text on the use of integral transforms. Chapter I is largely new, covering introductory aspects of complex variable theory. Emphasis is on the development of techniques and the connection between properties of transforms and the kind of problems for which they provide tools. Around 400 problems are accompanied in the text. It will be useful for graduate students and researchers working in mathematics and physics. Time-frequency analysis is a modern branch of harmonic analysis. It comprises all those parts of mathematics and its applications that use the structure of translations and modulations (or time-frequency shifts) for the analysis of functions and operators. Time-frequency analysis is a form of local Fourier analysis that treats time and frequency simultaneously and symmetrically. My goal is a systematic exposition of the foundations of time-frequency analysis, whence the title of the book. The topics range from the elementary theory of the short-time Fourier transform and classical results about the Wigner distribution via the recent theory of Gabor frames to quantitative methods in time-frequency analysis and the theory of pseudodifferential operators. This book is motivated by applications in signal analysis and quantum mechanics, but it is not about these applications. The main orientation is toward the detailed mathematical investigation of the rich and elegant structures underlying time-frequency analysis. Time-frequency analysis originates in the early development of quantum mechanics by H. Weyl, E. Wigner, and J. von Neumann around 1930, and in the theoretical foundation of information theory and signal analysis by D. Transform Analysis of Generalized Functions concentrates on finite parts of integrals, generalized functions and distributions. It gives a unified treatment of the distributional setting with
transform analysis, i.e. Fourier, Laplace, Stieltjes, Mellin, Hankel and Bessel Series. Included are accounts of applications of the theory of integral transforms in a distributional setting to the solution of problems arising in mathematical physics. Information on distributional solutions of differential, partial differential equations and integral equations is conveniently collected here. The volume will serve as introductory and reference material for those interested in analysis, applications, physics and engineering. Distills key concepts from linear algebra, geometry, matrices, calculus, optimization, probability and statistics that are used in machine learning. This text develops the necessary background in probability theory underlying diverse treatments of stochastic processes and their wide-ranging applications. In this second edition, the text has been reorganized for didactic purposes, new exercises have been added and basic theory has been expanded. General Markov dependent sequences and their convergence to equilibrium is the subject of an entirely new chapter. The introduction of conditional expectation and conditional probability very early in the text maintains the pedagogic innovation of the first edition; conditional expectation is illustrated in detail in the context of an expanded treatment of martingales, the Markov property, and the strong Markov property. Weak convergence of probabilities on metric spaces and Brownian motion are two topics to highlight. A selection of large deviation and/or concentration inequalities ranging from those of Chebyshev, Cramer–Chernoff, Bahadur–Rao, to Hoeffding have been added, with illustrative comparisons of their use in practice. This also includes a treatment of the Berry–Esseen error estimate in the central limit theorem. The authors assume mathematical maturity at a graduate level; otherwise the book is suitable for students with varying levels of background in analysis and measure theory. For the reader who needs refreshers, theorems from analysis and measure theory used in the main text are provided in comprehensive appendices, along with their proofs, for ease of reference. Rabi Bhattacharya is Professor of Mathematics at the University of Arizona. Edward Waymire is Professor of Mathematics at Oregon State University. Both authors have co-authored numerous books, including a series of four upcoming graduate textbooks in stochastic processes with applications. 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 graduate level for self-study. 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. The book covers important topics: basic properties of distributions, convolution, Fourier transforms, Sobolev spaces, weak solutions, distributions on locally convex spaces and on differentiable manifolds. It is a largely self-contained text.". Explores interaction between music and mathematics
Where To Download Distribution Theory And Transform Analysis An
Introduction To Generalized Functions With Applications A H Zemanian

including harmony, symmetry, digital music and perception of sound. This book is derived from lecture notes for a course on Fourier analysis for engineering and science students at the advanced undergraduate or beginning graduate level. Beyond teaching specific topics and techniques—all of which are important in many areas of engineering and science—the author’s goal is to help engineering and science students cultivate more advanced mathematical know-how and increase confidence in learning and using mathematics, as well as appreciate the coherence of the subject. He promises the readers a little magic on every page. The section headings are all recognizable to mathematicians, but the arrangement and emphasis are directed toward students from other disciplines. The material also serves as a foundation for advanced courses in signal processing and imaging. There are over 200 problems, many of which are oriented to applications, and a number use standard software. An unusual feature for courses meant for engineers is a more detailed and accessible treatment of distributions and the generalized Fourier transform. There is also more coverage of higher-dimensional phenomena than is found in most books at this level. Suitable for advanced undergraduate and graduate students, this text presents the general properties of partial differential equations, including the elementary theory of complex variables. Topics include one-dimensional wave equation, properties of elliptic and parabolic equations, separation of variables and Fourier series, nonhomogeneous problems, and analytic functions of a complex variable. Solutions. 1965 edition. This book explains many fundamental ideas on the theory of distributions. The theory of partial differential equations is one of the synthetic branches of analysis that combines ideas and methods from different fields of mathematics, ranging from functional analysis and harmonic analysis to differential geometry and topology. This presents specific difficulties to those studying this field. This second edition, which consists of 10 chapters, is suitable for upper undergraduate/graduate students and mathematicians seeking an accessible introduction to some aspects of the theory of distributions. It can also be used for one-semester course. Fourier Analysis in Probability Theory provides useful results from the theories of Fourier series, Fourier transforms, Laplace transforms, and other related studies. This 14-chapter work highlights the clarification of the interactions and analogies among these theories. Chapters 1 to 8 present the elements of classical Fourier analysis, in the context of their applications to probability theory. Chapters 9 to 14 are devoted to basic results from the theory of characteristic functions of probability distributors, the convergence of distribution functions in terms of characteristic functions, and series of independent random variables. This book will be of value to mathematicians, engineers, teachers, and students. This textbook is addressed to the needs of applied mathematicians, physicists, engineers etc., who are interested in studying the problems of mathematical physics in general and their approximate solutions on computer in particular. Almost all basic results of the theory of distributions are contained in the book. It contains almost all topics of Sobolev spaces which are essential for the study of elliptic boundary value problems and their finite element analysis. Additional topics have been included along with many interesting examples. Hence it can be read as an introduction to advanced treatises on distributions. 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. In an age where the amount of data collected from brain imaging is increasing constantly, it is of critical importance to analyze those data within an accepted framework to ensure proper integration and comparison of the information collected. This book describes the ideas and procedures that underlie the analysis of signals produced by the brain. The aim is to understand how the brain works, in terms of its functional architecture and dynamics. This book provides the background and methodology for the analysis of all types of brain imaging data, from functional magnetic resonance imaging to magnetoencephalography. Critically, Statistical Parametric Mapping provides a widely accepted conceptual framework which allows treatment of all these different modalities. This rests on an understanding of the brain's functional anatomy and the way that measured signals are caused experimentally. The book takes the reader from the basic concepts underlying the analysis of neuroimaging data to cutting edge approaches that would be difficult to find in any other source. Critically, the material is presented in an incremental way so that the reader can understand the precedents for each new development. This book will be particularly useful to neuroscientists engaged in any form of brain mapping; who have to contend with the real-world problems of data analysis and understanding the techniques they are using. It is primarily a scientific treatment and a didactic introduction to the analysis of brain imaging data. It can be used as both a textbook for students and scientists starting to use the techniques, as well as a reference for practicing neuroscientists. The book also serves as a companion to the software packages that have been developed for brain imaging data analysis. An essential reference and companion for users of the SPM software provides a complete description of the concepts and procedures entailed by the analysis of brain images. Offers full didactic treatment of the basic mathematics behind the analysis of brain imaging data stands as a compendium of all the advances in neuroimaging data analysis over the past decade. Adopts an easy to understand and incremental approach that takes the reader from basic statistics to state of the art approaches such as Variational Bayes Structured treatment of data analysis issues that links different modalities and models includes a series of appendices and tutorial-style chapters that makes even the most sophisticated approaches accessible. Techniques of Functional Analysis for Differential and Integral Equations describes a variety of powerful and modern tools from mathematical analysis, for graduate study and further research in ordinary differential equations, integral equations, partial differential equations. Knowledge of these techniques is particularly useful as preparation for graduate courses and PhD research in differential equations and numerical analysis, and more specialized topics such as fluid dynamics and control theory. Striking a balance between mathematical depth and accessibility, proofs involving more technical aspects of measure and integration theory are avoided, but clear statements and precise alternative references are given. The work provides many examples and exercises drawn from the literature. Provides an introduction to mathematical techniques widely used in applied mathematics and needed for advanced research in ordinary and partial differential equations, integral equations, numerical analysis, fluid dynamics and other areas. Establishes the advanced background needed for sophisticated literature review and research in differential equations and integral equations. Suitable for use as a textbook for a two-semester graduate level course for M.S. and Ph.D. students in Mathematics and Applied Mathematics.