Limaye Functional Analysis

This book is meant as a text for a first-year graduate course in analysis. In a sense, it covers the same topics as elementary calculus but treats them in a manner suitable for people who will be using it in further mathematical investigations. The organization avoids long chains of logical interdependence, so that chapters are mostly independent. This allows a course to omit material from some chapters without compromising the exposition of material from later chapters.

This book is an introductory text in functional analysis. Unlike many modern treatments, it begins with the particular and works its way to the more general. From the reviews: "This book is an excellent text for a first graduate course in functional analysis....Many interesting and important applications are included....It includes an abundance of exercises, and is written in the engaging and lucid style which we have come to expect from the author." --MATHEMATICAL REVIEWS

This second edition includes exercises at the end of each chapter, revised bibliographies, references and an index.

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.

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.

MAA guides series numbering on title page appears as # 49. It should read # 9.

Functional AnalysisNew Age International

"Functional Analysis, written in a clear and entertaining style for senior undergraduate and postgraduate students, discusses Hilbert spaces, Banach algebras, Operator theory and Topological vector spaces. The book covers many standard results including the Hahn-Banach, open mapping and closed graph theorems; the Banach-Steinhaus and the Banach-Alaoglu theorems; Riesz-Fischer and Riesz representation theorems; Gelfand-Mazur and Gelfand-Neumark theorems; Bipolar theorem; and the Kolmogoroff criterion for normability."--BOOK JACKET.

"A First Course in Functional Analysis lucidly covers Banach Spaces. Continuous linear functionals, the basic theorems of bounded linear operators, Hilbert spaces, Operators on Hilbert spaces. Spectral theory and Banach Algebras usually taught as a core course to post-graduate students in mathematics. The special distinguishing features of the book include the establishment of the spectral theorem for the compact normal operators in the infinite dimensional case exactly in the same form as in the finite dimensional case and a detailed treatment of the theory of Banach algebras leading to the proof of the Gelfand-Neumark structure theorem for Banach algebras."--BOOK JACKET.

The present book is based on lectures given by the author at the University of Tokyo during the past ten years. It is intended as a textbook to be studied by students on their own or to be used in a course on Functional Analysis, i. e. , the general theory of linear operators in function spaces together with salient features of its application to diverse fields of modern and classical analysis. Necessary prerequisites for the reading of this book are summarized, with or without proof, in Chapter 0 under titles: Set Theory, Topo logical Spaces, Measure Spaces and Linear Spaces. Then, starting with the chapter on Semi-norms, a general theory of Banach and Hilbert spaces is presented in connection with the theory of generalized functions of S. L. SOBOLEV and L. SCHWARTZ. While the book is primarily addressed to graduate students, it is hoped it might prove useful to research mathe maticians, both pure and applied. The reader may pass, e. g. , from Chapter IX (Analytical Theory of Semi-groups) directly to Chapter XIII (Ergodic Theory and Diffusion Theory) and to Chapter XIV (Integration of the Equation of Evolution). Such materials as "Weak Topologies and Duality in Locally Convex Spaces" and "Nuclear Spaces" are presented in the form of the appendices to Chapter V and Chapter X, respectively. These might be skipped for the first reading by those who are interested rather in the application of linear operators.

This book is based on lectures given at "Mekhmat", the Department of Mechanics and Mathematics at Moscow State University, one of the top mathematical departments worldwide, with a rich tradition of teaching functional analysis. Featuring an advanced course on real and functional analysis, the book presents not only core material traditionally included in university courses of different levels, but also a survey of the most important results of a more subtle nature, which cannot be considered basic but which are useful for applications. Further, it includes several hundred exercises of varying difficulty with tips and references. The book is intended for graduate and PhD students studying real and functional analysis as well as mathematicians and physicists whose research is related to functional analysis.

Exact eigenvalues, eigenvectors, and principal vectors of operators with infinite dimensional ranges can rarely be found. Therefore, one must approximate such operators by finite rank operators, then solve the original eigenvalue problem approximately. Serving as both an outstanding text for graduate students and as a source of current results for research scientists, Spectral Computations for Bounded Operators addresses the issue of solving eigenvalue problems for operators on infinite dimensional spaces. From a review of classical spectral theory through concrete approximation techniques to finite dimensional situations that can be implemented on a computer, this volume illustrates the marriage of pure and applied mathematics. It contains a variety of recent developments, including a new type of approximation that encompasses a variety of approximation methods but is simple to verify in practice. It also suggests a new stopping criterion for the QR Method and outlines advances in both the iterative refinement and acceleration techniques for improving the accuracy of approximations. The authors illustrate all definitions and results with elementary examples and include numerous exercises. Spectral Computations for Bounded Operators thus serves as both an outstanding text for second-year graduate students and as a source of current results for research scientists.

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.

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.

The Book Is Intended To Serve As A Textbook For An Introductory Course In Functional Analysis For The Senior Undergraduate And Graduate Students. It Can Also Be Useful For The Senior Students Of Applied Mathematics, Statistics, Operations Research, Engineering And Theoretical Physics. The Text Starts With A Chapter On Preliminaries Discussing Basic Concepts And Results Which Would Be Taken For Granted Later In The Book. This Is Followed By Chapters On Normed And Banach Spaces, Bounded Linear Operators, Bounded Linear Functionals. The Concept And Specific Geometry Of Hilbert Spaces, Functionals And Operators On Hilbert Spaces And Introduction To Spectral Theory. An Appendix Has Been Given On Schauder Bases.The Salient Features Of The Book Are: * Presentation Of The Subject In A Natural Way * Description Of The Concepts With Justification * Clear And Precise Exposition Avoiding Pendantry * Various Examples And Counter Examples * Graded Problems Throughout Each ChapterNotes And Remarks Within The Text Enhances The Utility Of The Book For The Students.

This book provides a concise and meticulous introduction to functional analysis. Since the topic draws heavily on the interplay between the algebraic structure of a linear space and the distance structure of a metric space, functional analysis is increasingly gaining the attention of not only mathematicians but also scientists and engineers. The purpose of the text is to present the basic aspects of functional analysis to this varied audience, keeping in mind the considerations of applicability. A novelty of this book is the inclusion of a result by Zabreiko, which states that every countably subadditive seminorm on a Banach space is continuous. Several major theorems in functional analysis are easy consequences of this result. The entire book can be used as a textbook for an introductory course in functional analysis without having to make any specific selection from the topics presented here. Basic notions in the setting of a metric space are defined in terms of sequences. These include total boundedness, compactness, continuity and uniform continuity. Offering concise and to-the-point treatment of each topic in the framework of a normed space and of an inner product space, the book represents a valuable resource for advanced undergraduate students in mathematics, and will also appeal to graduate students and faculty in the natural sciences and engineering. The book is accessible to anyone who is familiar with linear algebra and real analysis.

This classic text is written for graduate courses in functional analysis. This text is used in modern investigations in analysis and applied mathematics. This new edition includes up-to-date presentations of topics as well as more examples and exercises. New topics include Kakutani's fixed point theorem, Lamonosov's invariant subspace theorem, and an ergodic theorem. This text is part of the Walter Rudin Student Series in Advanced Mathematics.

Provides fundamental concepts about the theory, application and various methods involving functional analysis for students, teachers, scientists and engineers. Divided into three parts it covers: - Basic facts of linear algebra and real analysis. - Normed spaces, contraction mappings, linear operators between normed spaces and fundamental results on these topics. - Hilbert spaces and the representation of continuous linear function with applications. In this self-contained book, all the concepts, results and their consequences are motivated and illustrated by numerous examples in each chapter with carefully chosen exercises.

Includes sections on the spectral resolution and spectralrepresentation of self adjoint operators, invariant subspaces,strongly continuous one-parameter semigroups, the index ofoperators, the trace formula of Lidskii, the Fredholm determinant,and more. * Assumes prior knowledge of Naive set theory, linear algebra,point set topology, basic complex variable, and realvariables. * Includes an appendix on the Riesz representation theorem.

Intended as an introductory text on Functional Analysis for the postgraduate students of Mathematics, this compact and well-organized book covers all the topics considered essential to the subject. In so doing, it provides a very good understanding of the subject to the reader. The book begins with a review of linear algebra, and then it goes on to give the basic notion of a norm on linear space (proving thereby most of the basic results), progresses gradually, dealing with operators, and proves some of the basic theorems of Functional Analysis. Besides, the book analyzes more advanced topics like dual space considerations, compact operators, and spectral theory of Banach and Hilbert space operators. The text is so organized that it strives, particularly in the last chapter, to apply and relate the basic theorems to problems which arise while solving operator equations. The present edition is a thoroughly revised version of its first edition, which also includes a section on Hahn-Banach extension theorem for operators and discussions on Lax-Milgram theorem. This student-friendly text, with its clear exposition of concepts, should prove to be a boon to the beginner aspiring to have an insight into Functional Analysis. KEY FEATURES • Plenty of examples have been worked out in detail, which not only illustrate a particular result, but also point towards its limitations so that subsequent stronger results follow. • Exercises, which are designed to aid understanding and to promote mastery of the subject, are interspersed throughout the text. TARGET AUDIENCE • M.Sc. Mathematics

This book is intended as a textbook for a first course in the theory of functions of one complex variable for students who are mathematically mature enough to understand and execute E - I) arguments. The actual pre requisites for reading this book are quite minimal; not much more than a stiff course in basic calculus and a few facts about partial derivatives. The topics from advanced calculus that are used (e.g., Leibniz's rule for differ entiating under the integral sign) are proved in detail. Complex Variables is a subject which has something for all mathematicians. In addition to having applications to other parts of analysis, it can rightly claim to be an ancestor of many areas of mathematics (e.g., homotopy theory, manifolds). This view of Complex Analysis as "An Introduction to Mathe matics" has influenced the writing and selection of subject matter for this book. The other guiding principle followed is that all definitions, theorems, etc.

This book provides a self-contained and rigorous introduction to calculus of functions of one variable, in a presentation which emphasizes the structural development of calculus. Throughout, the authors highlight the fact that calculus provides a firm foundation to concepts and results that are generally encountered in high school and accepted on faith; for example, the classical result that the ratio of circumference to diameter is the same for all circles. A number of topics are treated here in considerable detail that may be inadequately covered in calculus courses and glossed over in real analysis courses.

This book addresses fixed point theory, a fascinating and far-reaching field with applications in several areas of mathematics. The content is divided into two main parts. The first, which is more theoretical, develops the main abstract theorems on the existence and uniqueness of fixed points of maps. In turn, the second part focuses on applications, covering a large variety of significant results ranging from ordinary differential equations in Banach spaces, to partial differential equations, operator theory, functional analysis, measure theory, and game theory. A final section containing 50 problems, many of which include helpful hints, rounds out the coverage. Intended for Master's and PhD students in Mathematics or, more generally, mathematically oriented subjects, the book is designed to be largely self-contained, although some mathematical background is needed: readers should be familiar with measure theory, Banach and Hilbert spaces, locally convex topological vector spaces and, in general, with linear functional analysis.

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.

In an elegant and concise fashion, this book presents the concepts of functional analysis required by students of mathematics and physics. It begins with the basics of normed linear spaces and quickly proceeds to concentrate on Hilbert spaces, specifically the spectral theorem for bounded as well as unbounded operators in separable Hilbert spaces. While the first two chapters are devoted to basic propositions concerning normed vector spaces and Hilbert spaces, the third chapter treats advanced topics which are perhaps not standard in a first course on functional analysis. It begins with the Gelfand theory of commutative Banach algebras, and proceeds to the Gelfand-Naimark theorem on commutative C*-algebras. A discussion of representations of C*-algebras follows, and the final section of this chapter is devoted to the Hahn-Hellinger classification of separable representations of commutative C*-algebras. After this detour into operator algebras, the fourth chapter reverts to more standard operator theory in Hilbert space, dwelling on topics such as the spectral theorem for normal operators, the polar decomposition theorem, and the Fredholm theory for compact operators. A brief introduction to the theory of unbounded operators on Hilbert space is given in the fifth and final chapter. There is a voluminous appendix whose purpose is to fill in possible gaps in the reader's background in various areas such as linear algebra, topology, set theory and measure theory. The book is interspersed with many exercises, and hints are provided for the solutions to the more challenging of these.

This Book Is An Introductory Text Written With Minimal Prerequisites. The Plan Is To Impose A Distance Structure On A Linear Space, Exploit It Fully And Then Introduce Additional Features Only When One Cannot Get Any Further Without Them. The Book Naturally Falls Into Two Parts And Each Of Them Is Developed Independently Of The Other The First Part Deals With Normed Spaces, Their Completeness And Continuous Linear Maps On Them, Including The Theory Of Compact Operators. The Much Shorter Second Part Treats Hilbert Spaces And Leads Upto The Spectral Theorem For Compact Self-Adjoint Operators. Four Appendices Point Out Areas Of Further Development.Emphasis Is On Giving A Number Of Examples To Illustrate Abstract Concepts And On Citing Varirous Applications Of Results Proved In The Text. In Addition To Proving Existence And Uniqueness Of A Solution, Its Apprroximate Construction Is Indicated. Problems Of Varying Degrees Of Difficulty Are Given At The End Of Each Section. Their Statements Contain The Answers As Well.

This text approaches integration via measure theory as opposed to measure theory via integration, an approach which makes it easier to grasp the subject. Apart from its central importance to pure mathematics, the material is also relevant to applied mathematics and probability, with proof of the mathematics set out clearly and in considerable detail. Numerous worked examples necessary for teaching and learning at undergraduate level constitute a strong feature of the book, and after studying statements of results of the theorems, students should be able to attempt the 300 problem exercises which test comprehension and for which detailed solutions are provided. Approaches integration via measure theory, as opposed to measure theory via integration, making it easier to understand the subject Includes numerous worked examples necessary for teaching and learning at undergraduate level Detailed solutions are provided for the 300 problem exercises which test comprehension of the theorems provided

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.

Since the last century, the postulational method and an abstract point of view have played a vital role in the development of modern mathematics. The experience gained from the earlier concrete studies of analysis point to the importance of passage to the limit. The basis of this operation is the notion of distance between any two points of the line or the complex plane. The algebraic properties of underlying sets often play no role in the development of analysis; this situation naturally leads to the study of metric spaces. The abstraction not only simplifies and elucidates mathematical ideas that recur in different guises, but also helps eco- mize the intellectual effort involved in learning them. However, such an abstract approach is likely to overlook the special features of particular mathematical developments, especially those not taken into account while forming the larger picture. Hence, the study of particular mathematical developments is hard to overemphasize. The language in which a large body of ideas and results of functional analysis are expressed is that of metric spaces. The books on functional analysis seem to go over the preliminaries of this topic far too quickly. The present authors attempt to provide a leisurely approach to the theory of metric spaces. In order to ensure that the ideas take root gradually but firmly, a large number of examples and counterexamples follow each definition. Also included are several worked examples and exercises. Applications of the theory are spread out over the entire book.

Provides avenues for applying functional analysis to the practical study of natural sciences as well as mathematics. Contains worked problems on Hilbert space theory and on Banach spaces and emphasizes concepts, principles, methods and major applications of functional analysis.

Topology is a large subject with several branches, broadly categorized as algebraic topology, point-set topology, and geometric topology. Point-set topology is the main language for a broad range of mathematical disciplines, while algebraic topology offers as a powerful tool for studying problems in geometry and numerous other areas of mathematics. This book presents the basic concepts of topology, including virtually all of the traditional topics in point-set topology, as well as elementary topics in algebraic topology such as fundamental groups and covering spaces. It also discusses topological groups and transformation groups. When combined with a working knowledge of analysis and algebra, this book offers a valuable resource for advanced undergraduate and beginning graduate students of mathematics specializing in algebraic topology and harmonic analysis.

A discussion of fundamental mathematical principles from algebra to elementary calculus designed to promote constructive mathematical reasoning.

Real Analysis is the third volume in the Princeton Lectures in Analysis, a series of four textbooks that aim to present, in an integrated manner, the core areas of analysis. Here the focus is on the development of measure and integration theory, differentiation and integration, Hilbert spaces, and Hausdorff measure and fractals. This book reflects the objective of the series as a whole: to make plain the organic unity that exists between the various parts of the subject, and to illustrate the wide applicability of ideas of analysis to other fields of mathematics and science. After setting forth the basic facts of measure theory, Lebesgue integration, and differentiation on Euclidian spaces, the authors move to the elements of Hilbert space, via the L2 theory. They next present basic illustrations of these concepts from Fourier analysis, partial differential equations, and complex analysis. The final part of the book introduces the reader to the fascinating subject of fractional-dimensional sets, including Hausdorff measure, self-replicating sets, space-filling curves, and Besicovitch sets. Each chapter has a series of exercises, from the relatively easy to the more complex, that are tied directly to the text. A substantial number of hints encourage the reader to take on even the more challenging exercises. As with the other volumes in the series, Real Analysis is accessible to students interested in such diverse disciplines as mathematics, physics, engineering, and finance, at both the undergraduate and graduate levels. Also available, the first two volumes in the Princeton Lectures in Analysis:

This self-contained textbook gives a thorough exposition of multivariable calculus. The emphasis is on correlating general concepts and results of multivariable calculus with their counterparts in one-variable calculus. Further, the book includes genuine analogues of basic results in one-variable calculus, such as the mean value theorem and the fundamental theorem of calculus. This book is distinguished from others on the subject: it examines topics not typically covered, such as monotonicity, bimonotonicity, and convexity, together with their relation to partial differentiation, cubature rules for approximate evaluation of double integrals, and conditional as well as unconditional convergence of double series and improper double integrals. Each chapter contains detailed proofs of relevant results, along with numerous examples and a wide collection of exercises of varying degrees of difficulty, making the book useful to undergraduate and graduate students alike.

This self-contained reference/text presents a thorough account of the theory of real function algebras. Employing the intrinsic approach, avoiding the complexification technique, and generalizing the theory of complex function algebras, this single-source volume includes: an introduction to real Banach algebras; various generalizations of the Stone-Weierstrass theorem; Gleason parts; Choquet and Shilov boundaries; isometries of real function algebras; extensive references; and a detailed bibliography.;Real Function Algebras offers results of independent interest such as: topological conditions for the commutativity of a real or complex Banach algebra; Ransford's short elementary proof of the Bishop-Stone-Weierstrass theorem; the implication of the analyticity or antianalyticity of f from the harmonicity of Re f, Re f(2), Re f(3), and Re f(4); and the positivity of the real part of a linear functional on a subspace of C(X).;With over 600 display equations, this reference is for mathematical analysts; pure, applied, and industrial mathematicians; and theoretical physicists; and a text for courses in Banach algebras and function algebras.

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

"This book covers such topics as Lp? 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.

Key Features:Basic knowledge in functional analysis is a pre-requisite. Illustrations via partial differential equations of physics provided. Exercises given in each chapter to augment concepts and theorems.About the Book:The book, written to give a fairly comprehensive treatment of the techniques from Functional Analysis used in the modern theory of Partial Differential Equations, is now in its third edition. The original structure of the book has been retained but each chapter has been revamped. Proofs of several theorems have been either simplified or elaborated in order to achieve greater clarity. It is hoped that this version is even more user-friendly than before. In the chapter on Distributions, some additional results, with proof, have been presented. The section on Convolution of Functions has been rewritten. In the chapter on Sobolev Spaces, the section containing Stampacchia's theorem on composition of functions has been reorganized. Some additional results on Eigenvalue problems are presented. The material in the text is supplemented by four appendices and updated bibliography at the end.