

Spectral Theory Of Guided Waves

**Pavel Kurasov, Ari Laptev, Sergey
Naboko, Barry Simon**



Spectral Theory Of Guided Waves:

Spectral Theory of Guided Waves A.S Silbergleit, Y Kopilevich, 2021-08-02 Spectral Theory of Guided Waves represents a distillation of the authors and others efforts over several years to rigorously discuss many of the properties of guided waves The bulk of the book deals with the properties of eigenwaves of regular waveguiding systems and relates these to a variety of physical situations and applications to illustrate their generality The book also includes considerable discussion of the basic properties of normal waves with quadratic operator pencils Unique in its coverage of these subjects the book will be of interest to engineers applied mathematicians and physicists with a working knowledge of functional analysis and spectral theory

Spectral Theory and Excitation of Open Structures V. P. Shestopalov, 1996 Open resonators open waveguides and open diffraction gratings are used extensively in modern millimetre and submillimetre technology spectroscopy and radio engineering In this book the physical processes in these open electromagnetic structures are analysed using a specially constructed spectral theory

Spectral Theory of Operator Pencils, Hermite-Biehler Functions, and their Applications Manfred Möller, Vyacheslav Pivovarchik, 2015-06-11 The theoretical part of this monograph examines the distribution of the spectrum of operator polynomials focusing on quadratic operator polynomials with discrete spectra The second part is devoted to applications Standard spectral problems in Hilbert spaces are of the form AI for an operator A and self adjoint operators are of particular interest and importance both theoretically and in terms of applications A characteristic feature of self adjoint operators is that their spectra are real and many spectral problems in theoretical physics and engineering can be described by using them However a large class of problems in particular vibration problems with boundary conditions depending on the spectral parameter are represented by operator polynomials that are quadratic in the eigenvalue parameter and whose coefficients are self adjoint operators The spectra of such operator polynomials are in general no more real but still exhibit certain patterns The distribution of these spectra is the main focus of the present volume For some classes of quadratic operator polynomials inverse problems are also considered The connection between the spectra of such quadratic operator polynomials and generalized Hermite Biehler functions is discussed in detail Many applications are thoroughly investigated such as the Regge problem and damped vibrations of smooth strings Stieltjes strings beams star graphs of strings and quantum graphs Some chapters summarize advanced background material which is supplemented with detailed proofs With regard to the reader's background knowledge only the basic properties of operators in Hilbert spaces and well known results from complex analysis are assumed

Field Theory of Guided Waves Robert E. Collin, 1990-12-15 Co published with Oxford University Press Long considered the most comprehensive account of electromagnetic theory and analytical methods for solving waveguide and cavity problems this new Second Edition has been completely revised and thoroughly updated approximately 40% new material Packed with examples and applications FIELD THEORY OF GUIDED WAVES provides solutions to a large number of practical structures of current interest The book

includes an exceptionally complete discussion of scalar and Dyadic Green functions Both a valuable review and source of basic information on applied mathematical topics and a hands on source for solution methods and techniques this book belongs on the desk of all engineers working in microwave and antenna systems Sponsored by IEEE Antennas and Propagation Society

Spectral Theory and Differential Equations E. Khruslov, L. Pastur, D. Shepelsky, 2014-09-26 This volume is dedicated to V A Marchenko on the occasion of his 90th birthday It contains refereed original papers and survey articles written by his colleagues and former students of international stature and focuses on the areas to which he made important contributions spectral theory of differential and difference operators and related topics of mathematical physics including inverse problems of spectral theory homogenization theory and the theory of integrable systems The papers in the volume provide a comprehensive account of many of the most significant recent developments in that broad spectrum of areas

Optical Waveguide Theory Yuri Shestopalov, Yuri Smirnov, Eugene Smolkin, 2022-03-26 This book addresses the most advanced to date mathematical approach and numerical methods in electromagnetic field theory and wave propagation It presents the application of developed methods and techniques to the analysis of waves in various guiding structures shielded and open metal dielectric waveguides of arbitrary cross section planar and circular waveguides filled with inhomogeneous dielectrics metamaterials chiral media anisotropic media and layered media with absorption It also looks into spectral properties of wave propagation for the waveguide families being considered and the relevant mathematical techniques such as spectral theory of non self adjoint operator valued functions are described including rigorous proofs of the existence of various types of waves Further numerical methods constructed on the basis of the presented mathematical approach and the results of numerical modeling for various structures are also described in depth The book is beneficial to a broad spectrum of readers ranging from pure and applied mathematicians in electromagnetic field theory to researchers and engineers who are familiar with mathematics Further it is also useful as a supplementary text for upper level undergraduate students interested in learning more advanced topics of mathematical methods in electromagnetics

Recent Advances in Matrix and Operator Theory Joseph A. Ball, Yuli Eidelman, J. William Helton, Vadim Olshevsky, James Rovnyak, 2007-12-22 This volume comprises the proceedings of the International Workshop on Operator Theory and Its Applications held at the University of Connecticut in July 2005

Theory of Waveguides and Transmission Lines Edward F. Kuester, 2020-09-19 This book covers the principles of operation of electromagnetic waveguides and transmission lines The approach is divided between mathematical descriptions of basic behaviors and treatment of specific types of waveguide structures Classical distributed network transmission lines their basic properties their connection to lumped element networks and the distortion of pulses are discussed followed by a full field analysis of waveguide modes Modes of specific kinds of waveguides traditional hollow metallic waveguides dielectric including optical waveguides etc are discussed Problems of excitation and scattering of waveguide modes are addressed followed by discussion of real systems and performance

Recent Developments in

Surface Acoustic Waves David F. Parker, Gerard A. Maugin, 2012-12-06 The topic of surface waves lies at the interface between a number of disciplines: physics, theoretical and applied mechanics, electroacoustics, applied mathematics, surface science and seismology. This volume, based on papers delivered at European Mechanics Colloquium 226, reflects this diversity in approach and background while showing strong links between phenomena arising from different fields. The emphasis is on recent developments such as nonlinear and other nonclassical effects which have great importance for both pure science and for applications such as signal processing, nondestructive evaluation and seismic studies. In recent years there has been considerable progress in the mathematical treatment of nonlinear effects of viscoelastic and of more novel constitutive effects which modify the predictions of linear elastic and piezoelectric theory for surface acoustic wave (SAW) propagation. A number of these themes serve to group the contents of this volume. Part I contains recent advances in the rigorous mathematical treatment of nonlinearity together with a paper giving experimental results showing the need for further theoretical development. Part II deals with anisotropic elasticity showing that even the linear theory presents many possible behaviours which are still not fully categorized. Spectral and Scattering Theory for Wave Propagation in Perturbed Stratified Media

Ricardo Weder, 2012-12-06 The propagation of acoustic and electromagnetic waves in stratified media is a subject that has profound implications in many areas of applied physics and in engineering: just to mention a few, in ocean acoustics, integrated optics and wave guides. See for example Tolstoy and Clay 1966, Marcuse 1974 and Brekhovskikh 1980. As is well known, stratified media—that is to say, media whose physical properties depend on a single coordinate—can produce guided waves that propagate in directions orthogonal to that of stratification, in addition to the free waves that propagate as in homogeneous media. When the stratified media are perturbed—that is to say, when locally the physical properties of the media depend upon all of the coordinates—the free and guided waves are no longer solutions to the appropriate wave equations, and this leads to a rich pattern of wave propagation that involves the scattering of the free and guided waves among each other and with the perturbation. These phenomena have many implications in applied physics and engineering, such as in the transmission and reflexion of guided waves by the perturbation, interference between guided waves and energy losses in open wave guides due to radiation. The subject matter of this monograph is the study of these phenomena.

Progress in Computational Physics (PiCP): Volume 1 Matthias Ehrhardt, 2010 Progress in Computational Physics is a new e-book series devoted to recent research trends in computational physics. It contains chapters contributed by outstanding experts of modeling of physical problems. The series focuses on interdisciplinary computation. **Floquet Theory for Partial Differential Equations** P.A. Kuchment, 2012-12-06 Linear differential equations with periodic coefficients constitute a well-developed part of the theory of ordinary differential equations (179, 156, 177, 178, 272, 389). They arise in many physical and technical applications (177, 178, 272). A new wave of interest in this subject has been stimulated during the last two decades by the development of the inverse scattering method for integration of nonlinear differential equations. This

has led to significant progress in this traditional area 27 71 72 111 119 250 276 277 284 286 287 312 313 337 349 354 392 393 403 404 At the same time many theoretical and applied problems lead to periodic partial differential equations We can mention for instance quantum mechanics 14 18 40 54 60 91 92 107 123 157 160 192 193 204 315 367 412 414 415 417 hydrodynamics 179 180 elasticity theory 395 the theory of guided waves 87 89 208 300 homogenization theory 29 41 348 direct and inverse scattering 175 206 216 314 388 406 408 parametric resonance theory 122 178 and spectral theory and spectral geometry 103 105 381 382 389 There is a significant distinction between the cases of ordinary and partial differential periodic equations The main tool of the theory of periodic ordinary differential equations is the so called Floquet theory 17 94 120 156 177 267 272 389 Its central result is the following theorem sometimes called Floquet Lyapunov theorem 120 267

Analysis as a Tool in Mathematical Physics Pavel Kurasov,Ari Laptev,Sergey Naboko,Barry Simon,2020-07-14 Boris Pavlov 1936 2016 to whom this volume is dedicated was a prominent specialist in analysis operator theory and mathematical physics As one of the most influential members of the St Petersburg Mathematical School he was one of the founders of the Leningrad School of Non self adjoint Operators This volume collects research papers originating from two conferences that were organized in memory of Boris Pavlov Spectral Theory and Applications held in Stockholm Sweden in March 2016 and Operator Theory Analysis and Mathematical Physics OTAMP2016 held at the Euler Institute in St Petersburg Russia in August 2016 The volume also includes water color paintings by Boris Pavlov some personal photographs as well as tributes from friends and colleagues

Operator Methods in Ordinary and Partial Differential Equations Sergio Albeverio,Nils Elander,W. Nirrie Everitt,Pavel Kurasov,2012-12-06 CO i b H BaCHJlbeBHa lU BaJleBcR8JI Sonja Kovalevsky was born in Moscow in 1850 and died in Stockholm in 1891 Between these years in the then changing and turbulent circumstances for Europe lies the all too brief life of this remarkable woman This life was lived out within the great European centers of power and learning in Russia France Germany Switzerland England and Sweden To this day now 150 years after her birth her influence for and contribution to mathematics science literature women s rights and democratic government are recorded and reviewed not only in Europe but now in countries far removed in time and distance from the lands of her birth and being This volume dedicated to her memory and to her achievements records the Proceedings of the Marcus Wallenberg Symposium held in memory of Sonja Kovalevsky at Stockholm University from 18 to 22 June 2000 The symposium was held at the Department of Mathematics with its excellent library and lecture halls providing favourable working conditions Within these pages are contained a curriculum vitae for Sonja Kovalevsky a list of all her scientific publications together with a copy of the moving and elegant obituary notice written by her friend and protector Gosta Mittag Leffler These papers are followed by a leading article entitled Sonja Kovalevsky Her life and professorship in Stockholm written especially for this volume by Jan Erik Bjork in preparation for his major address to the Symposium

Electromagnetic Wave Diffraction by Conducting Screens pseudodifferential operators in diffraction problems Yu. G.

Smirnov,2022-03-23 This book covers the latest problems of modern mathematical methods for three dimensional problems of diffraction by arbitrary conducting screens This comprehensive study provides an introduction to methods of constructing generalized solutions elements of potential theory and other underlying mathematical tools The problem settings which turn out to be extremely effective differ significantly from the known approaches and are based on the original concept of vector spaces produced by Maxwell equations The formalism of pseudodifferential operators enables to prove uniqueness theorems and the Fredholm property for all problems studied Readers will gain essential insight into the state of the art technique of investigating three dimensional problems for closed and unclosed screens based on systems of pseudodifferential equations A detailed treatment of the properties of their kernels in particular degenerated is included Special attention is given to the study of smoothness of generalized solutions and properties of traces **Theory of Elastic Waves** Peijun Wei,2022-11-30

This book highlights a systematic introduction to the basic theory of elastic wave propagation in complex media The theory of elastic waves is widely used in fields such as geophysical exploration seismic survey medical ultrasound imaging nondestructive testing of materials and structures phononic crystals metamaterials and structure health monitoring To help readers develop a systematic grasp of the basic theory and thus its applications the book elaborates on the theory of elastic wave propagation in isotropic solid media covering phenomena in infinite media interfaces layered structure with finite thickness Rayleigh wave and Love wave propagating along the surface of semi infinite solid and covering layer and the guided waves and leaky waves in flat plates and in cylindrical rods The propagation patterns and features of guided waves in cylindrical shells and spherical shells are also introduced The author wrote the book based on a decade of teaching experience of a graduate course of the same name and two decades of research on the theory and applications The book is a valuable reference for students researchers and professionals who expect an understandable and comprehensive discussion of the theory analytical methods and related research results *Electromagnetic Wave Theory* J. C. Brown,2016-01-21

International Series of Monographs in Electromagnetic Waves Volume 11 Electromagnetic Wave Theory Part 1 covers the proceedings of an International Scientific Radio Union U R S I Symposium on Electromagnetic Wave Theory The book contains 61 chapters that are organized into three sections The first section presents papers about wave propagation which includes lateral waves terrestrial waveguides and plane waves in dissipative media Next the title reviews studies about wave guides including basic properties of periodic waveguides theoretical investigation of non uniform waveguides and waves in a coaxial line partially filled with plasma The last section covers topics about surface waves such as a dielectric prism in the corner of overmoded waveguide lasers and optical communication systems and microwave and laser resonators The text will be of great use to researchers and practitioners of disciplines that study or utilize electromagnetic wave technologies such as electrotechnics and electrical engineering Mesh Methods for Boundary-Value Problems and Applications Ildar B.

Badriev,Victor Banderov,Sergey A. Lapin,2022-09-14 This book gathers papers presented at the 13th International

Conference on Mesh Methods for Boundary Value Problems and Applications which was held in Kazan Russia in October 2020 The papers address the following topics the theory of mesh methods for boundary value problems in mathematical physics non linear mathematical models in mechanics and physics algorithms for solving variational inequalities computing science and educational systems Given its scope the book is chiefly intended for students in the fields of mathematical modeling science and engineering However it will also benefit scientists and graduate students interested in these fields

Radio Science ,1998 Theory and Phenomena of Metamaterials Filippo Capolino,2017-12-19 Theory and Phenomena of Metamaterials offers an in depth look at the theoretical background and basic properties of electromagnetic artificial materials often called metamaterials A volume in the Metamaterials Handbook this book provides a comprehensive guide to working with metamaterials using topics presented in a concise review format along with numerous references With contributions from leading researchers this text covers all areas where artificial materials have been developed Each chapter in the text features a concluding summary as well as various cross references to address a wide range of disciplines in a single volume

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