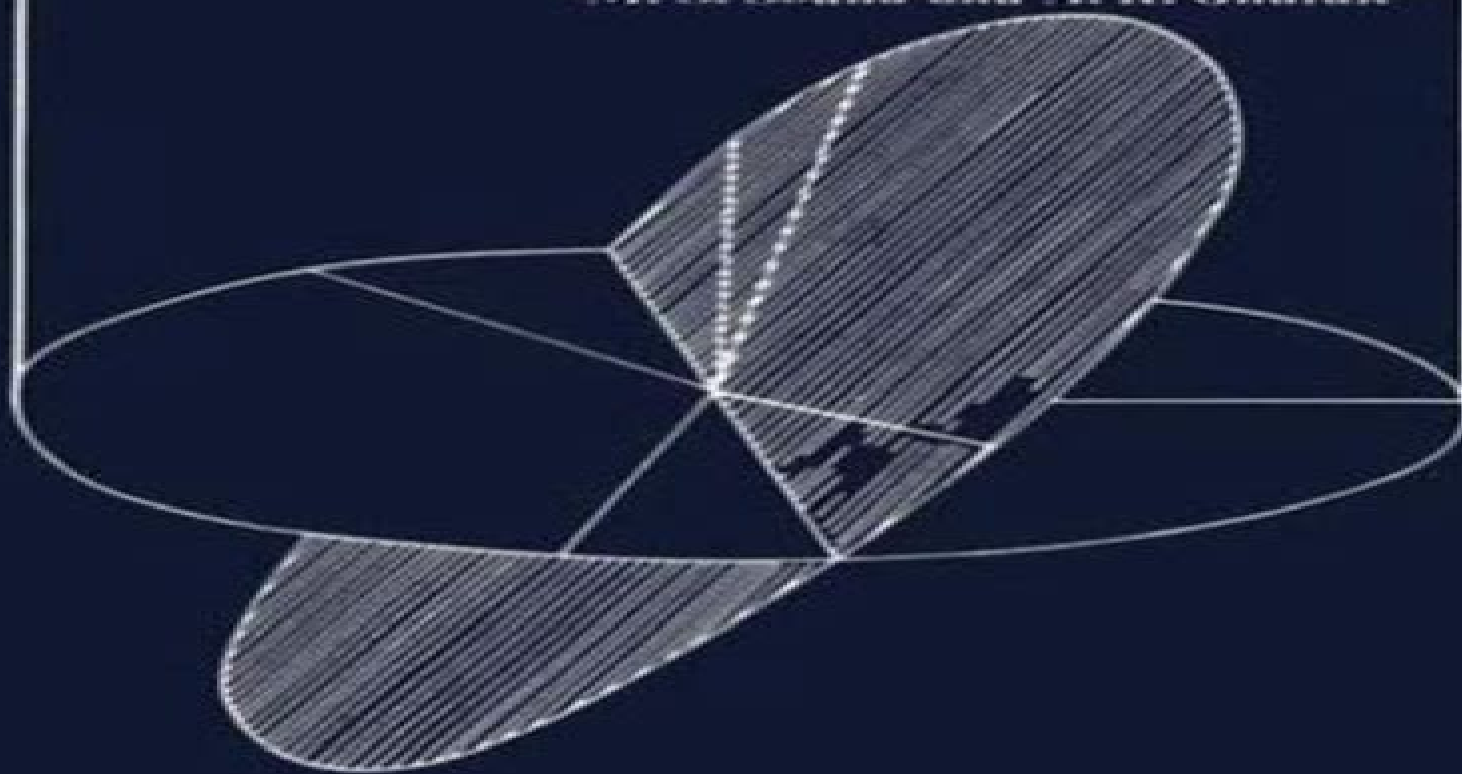


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Inhomogeneous Optical Waveguides

M. S. Sodha and A. K. Ghatak



Inhomogeneous Optical Waveguides

Thokala Soloman Raju



Inhomogeneous Optical Waveguides:

Inhomogeneous Optical Waveguides A. Ghatak, 2013-03-09 The propagation of electromagnetic waves in square law media i.e. media characterized by a quadratic spatial variation of the dielectric constant has been a favorite subject of investigation in electromagnetic theory. However, with the recent fabrication of glass fibers with a quadratic radial variation of the dielectric constant and the application of such fibers to optical imaging and communications, this subject has also assumed practical importance. Comparison of experimental results on propagation resolution and pulse distortion in such inhomogeneous waveguides with theory has put the field on a sound base and spurred further work. The present book aims at presenting a unified view of important aspects of our knowledge of inhomogeneous optical waveguides. A brief discussion of homogeneous dielectric waveguides is unavoidable since it forms a basis for the appreciation of inhomogeneous waveguides. A short course based on some chapters of this book was offered to graduate students at IIT Delhi and was well received. We consider that despite the unavoidable mathematical nature of the present book, the comparison of experimental results with theory throughout and the description of fabrication technology. Appendixes A and B should make its appeal universal. The authors are grateful to Dr K Thyagarajan for writing most of Chapter 9 and to their colleagues Dr I C Goyal, Dr B P Pal and Dr A

Inhomogeneous Optical Waveguides Ajoy Ghatak, 2013-08-09 The propagation of electromagnetic waves in square law media i.e. media characterized by a quadratic spatial variation of the dielectric constant has been a favorite subject of investigation in electromagnetic theory. However, with the recent fabrication of glass fibers with a quadratic radial variation of the dielectric constant and the application of such fibers to optical imaging and communications, this subject has also assumed practical importance. Comparison of experimental results on propagation resolution and pulse distortion in such inhomogeneous waveguides with theory has put the field on a sound base and spurred further work. The present book aims at presenting a unified view of important aspects of our knowledge of inhomogeneous optical waveguides. A brief discussion of homogeneous dielectric waveguides is unavoidable since it forms a basis for the appreciation of inhomogeneous waveguides. A short course based on some chapters of this book was offered to graduate students at IIT Delhi and was well received. We consider that despite the unavoidable mathematical nature of the present book, the comparison of experimental results with theory throughout and the description of fabrication technology. Appendixes A and B should make its appeal universal. The authors are grateful to Dr K Thyagarajan for writing most of Chapter 9 and to their colleagues Dr I C Goyal, Dr B P Pal and Dr A

Optical Waveguides María L. Calvo, Vasudevan Lakshminarayanan, 2018-10-03 Although the theory and principles of optical waveguides have been established for more than a century, the technologies have only been realized in recent decades. Optical Waveguides: From Theory to Applied Technologies combines the most relevant aspects of waveguide theory with the study of current detailed waveguiding technologies in particular photonic devices, telecommunication applications and biomedical optics. With self-contained chapters written by well-known specialists, the book features both fundamentals and

applications The first three chapters examine the theoretical foundations and bases of planar optical waveguides as well as critical optical properties such as birefringence and nonlinear optical phenomena The next several chapters focus on contemporary waveguiding technologies that include photonic devices and telecommunications The book concludes with discussions on additional technological applications including biomedical optical waveguides and the potential of neutron waveguides As optical waveguides play an increasing part in modern technology photonics will become to the 21st century what electronics were to the 20th century Offering both novel insights for experienced professionals and introductory material for novices this book facilitates a better understanding of the new information era the photonics century

Progress in Planar Optical Waveguides Xianping Wang, Cheng Yin, Zhuangqi Cao, 2015-11-25 This book provides a comprehensive description of various slab waveguide structures ranged from graded index waveguide to symmetrical metal cladding waveguide In this book the transfer Matrix method is developed and applied to analyze the simplest case and the complex generalizations A novel symmetrical metal cladding waveguide structure is proposed and systematically investigated for several issues of interest such as biochemical sensing Goos H nchen shift and the slow light effect etc Besides this book summarizes the authors research works on waveguides over the last decade The readers who are familiar with basic optics theory may find this book easy to read and rather inspiring

Optical Waveguide Theory Yury Shestopalov, Yury 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

The Polarization of Light in Anisotropic Inhomogeneous Optical Waveguides and Design of Optical Fiber Spectrometers Kyung-Mog Lee, 1995

Advanced Materials for Integrated Optical Waveguides Xingcun Colin Tong Ph.D, 2013-10-17 This book provides a comprehensive introduction to integrated optical waveguides for information technology and data communications Integrated coverage ranges from advanced materials fabrication and characterization techniques to guidelines for design and simulation A concluding chapter offers perspectives

on likely future trends and challenges The dramatic scaling down of feature sizes has driven exponential improvements in semiconductor productivity and performance in the past several decades However with the potential of gigascale integration size reduction is approaching a physical limitation due to the negative impact on resistance and inductance of metal interconnects with current copper trace based technology Integrated optics provides a potentially lower cost higher performance alternative to electronics in optical communication systems Optical interconnects in which light can be generated guided modulated amplified and detected can provide greater bandwidth lower power consumption decreased interconnect delays resistance to electromagnetic interference and reduced crosstalk when integrated into standard electronic circuits Integrated waveguide optics represents a truly multidisciplinary field of science and engineering with continued growth requiring new developments in modeling further advances in materials science and innovations in integration platforms In addition the processing and fabrication of these new devices must be optimized in conjunction with the development of accurate and precise characterization and testing methods Students and professionals in materials science and engineering will find **Advanced Materials for Integrated Optical Waveguides** to be an invaluable reference for meeting these research and development goals **Optical Waveguide Sciences** H. Huang-Chia,A.W. Snyder,2012-12-06

Over the past decade or more the art relating to modern optical waveguides has evolved as a highly focused interdisciplinary field so attractive stimulating and full of far reaching promise that no parallel could be found earlier in other branches of applied sciences except perhaps in solid state electronics and computer technology This Proceedings with a selection of 53 papers and briefs by 96 authors of 16 countries is of real international dimensions It is the outgrowth of the International Symposium held June 20 23 1983 the first international meeting on this subject taking place in China Since almost every country in the world Eastern or western large or small has been involved in the study and promotion of this technological revolution it is only natural that China should be happy to serve as host country of the international meeting to promote an interchange of experiences and ideas conducive to greater achievements in the future **Controllable Nonlinear Waves**

in Graded-Index Waveguides (GRIN) Thokala Solomon Raju,2024-02-28 This book highlights the dynamical behavior of self similar waves in graded index waveguides in 1 1 dimensions and 2 1 dimensions The mechanism to control these optical similaritons by tailoring the tapering profile is presented Various nonlinear waves like rogons butterfly shaped and dromion like waves and their controllable behavior are discussed in detail The phenomenon of unbreakable Parity Time symmetry of some of these waves has been delineated for different variety of solvable potentials Compression of these exotic waves has been demonstrated for dispersion decreasing fiber and periodic management of dispersion and nonlinearity parameters Competing cubic quintic nonlinearity scenario and its potential implication on the dynamics of these similaritons has been described in detail Symbiotic self similar rogue waves have been discussed in 2 1 dimensional graded index waveguide The book also includes numerical simulations that complement these analytical insights Pulse Propagation in Inhomogeneous

Optical Waveguides. Progress Report, September 15, 1992--September 14, 1993, 1993 This report discusses pulse propagation in inhomogeneous optical waveguides and fibers

Theory of Nonuniform Waveguides B. Z.

Katsenelenbaum, 1998 This book presents and develops the mathematical tools required to effectively examine and analyse propagation processes of waves of various natures using the cross section method in artificial and non artificial waveguides These techniques are used in the solution of practical situations in various fields such as plasma heating in nuclear fusion materials processing and radar and satellite communication systems

Integrated Optics Robert G.

Hunsperger, 2009-04-29 Integrated Optics explains the subject of optoelectronic devices and their use in integrated optics and fiber optic systems The approach taken is to emphasize the physics of how devices work and how they can be and have been used in various applications as the field of optoelectronics has progressed from microphotonics to nanophotonics Illustrations and references from technical journals have been used to demonstrate the relevance of the theory to currently important topics in industry By reading this book scientists engineers students and engineering managers can obtain an overall view of the theory and the most recent technology in Integrated Optics

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

Riche mobilier... tapisseries... argenterie moderne, 1869

The Essence of Dielectric Waveguides

C. Yeh, F. Shimabukuro, 2008-06-17 The Essence of Dielectric Waveguides provides an overview of the fundamental behavior of guided waves essential to finding and interpreting the results of electromagnetic waveguide problems Clearly and concisely written as well as brilliantly organized this volume includes a detailed description of the fundamentals of electromagnetics as well as a new discussion on boundary conditions and attenuation It also covers the propagation characteristics of guided waves along classical canonical dielectric structures planar circular cylindrical rectangular and elliptical waveguides What's more the authors have included extensive coverage of inhomogeneous structures and approximate methods as well as several powerful numerical approaches specifically applicable to dielectric waveguides

Planar Circuits for Microwaves and Lightwaves

T. Okoshi, 2012-12-06 Until recently three principal classes had been known in the electrical circuitry They were as follows 1 The lumped constant circuit which should be called a zero dimensional circuit in the sense that the circuit elements are much smaller in size as compared with the wavelength in all three spatial directions 2 The distributed constant circuit which should be called a one dimensional circuit in the sense that

the circuit elements are much smaller than the wavelength in two directions but comparable to the wavelength in one direction 3 The waveguide circuit which should be called a three dimensional circuit in the sense that the circuit elements are comparable to the wavelength in all three directions The principal subject of this book is the analysis and design synthesis theories for another circuit class which appeared in the late 1960s and became common in the 1970s This new circuit class is 4 the planar circuit which should be called a two dimensional circuit in the sense that the circuit elements are much smaller in size as compared with the wavelength in one direction but comparable to the wavelength in the other two directions

Mathematical Optics Vasudevan Lakshminarayanan, María L. Calvo, Tatiana Alieva, 2018-10-08 Going beyond standard introductory texts *Mathematical Optics Classical Quantum and Computational Methods* brings together many new mathematical techniques from optical science and engineering research Profusely illustrated the book makes the material accessible to students and newcomers to the field Divided into six parts the text presents state of the art mathematical methods and applications in classical optics quantum optics and image processing Part I describes the use of phase space concepts to characterize optical beams and the application of dynamic programming in optical waveguides Part II explores solutions to paraxial linear and nonlinear wave equations Part III discusses cutting edge areas in transformation optics such as invisibility cloaks and computational plasmonics Part IV uses Lorentz groups dihedral group symmetry Lie algebras and Liouville space to analyze problems in polarization ray optics visual optics and quantum optics Part V examines the role of coherence functions in modern laser physics and explains how to apply quantum memory channel models in quantum computers Part VI introduces super resolution imaging and differential geometric methods in image processing As numerical symbolic computation is an important tool for solving numerous real life problems in optical science many chapters include Mathematica code in their appendices The software codes and notebooks as well as color versions of the book's figures are available at www.crcpress.com *Inverse Problems and Large-Scale Computations* Larisa Beilina, Yury V.

Shestopalov, 2013-10-01 This volume is a result of two international workshops namely the Second Annual Workshop on Inverse Problems and the Workshop on Large Scale Modeling held jointly in Sunne Sweden from May 1 6 2012 The subject of the inverse problems workshop was to present new analytical developments and new numerical methods for solutions of inverse problems The objective of the large scale modeling workshop was to identify large scale problems arising in various fields of science and technology and covering all possible applications with a particular focus on urgent problems in theoretical and applied electromagnetics The workshops brought together scholars professionals mathematicians and programmers and specialists working in large scale modeling problems The contributions in this volume are reflective of these themes and will be beneficial to researchers in this area *Optical Principles and Technology for Engineers* James Stewart, 2018-10-08 Discussing the principles of physical and geometrical optics from an engineering point of view this book explains current optical technology and the applications of optical methods in a wide variety of fields from astronomy and

agriculture to medicine and semiconductors It offers guidance in the selection of optical components for the construction of bread board models using commercially available standard components and provides immediately useful equations without unnecessary mathematical derivations **Handbook of Engineering Electromagnetics** Rajeev Bansal,2004-09-01

Engineers do not have the time to wade through rigorously theoretical books when trying to solve a problem Beginners lack the expertise required to understand highly specialized treatments of individual topics This is especially problematic for a field as broad as electromagnetics which propagates into many diverse engineering fields The time h

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