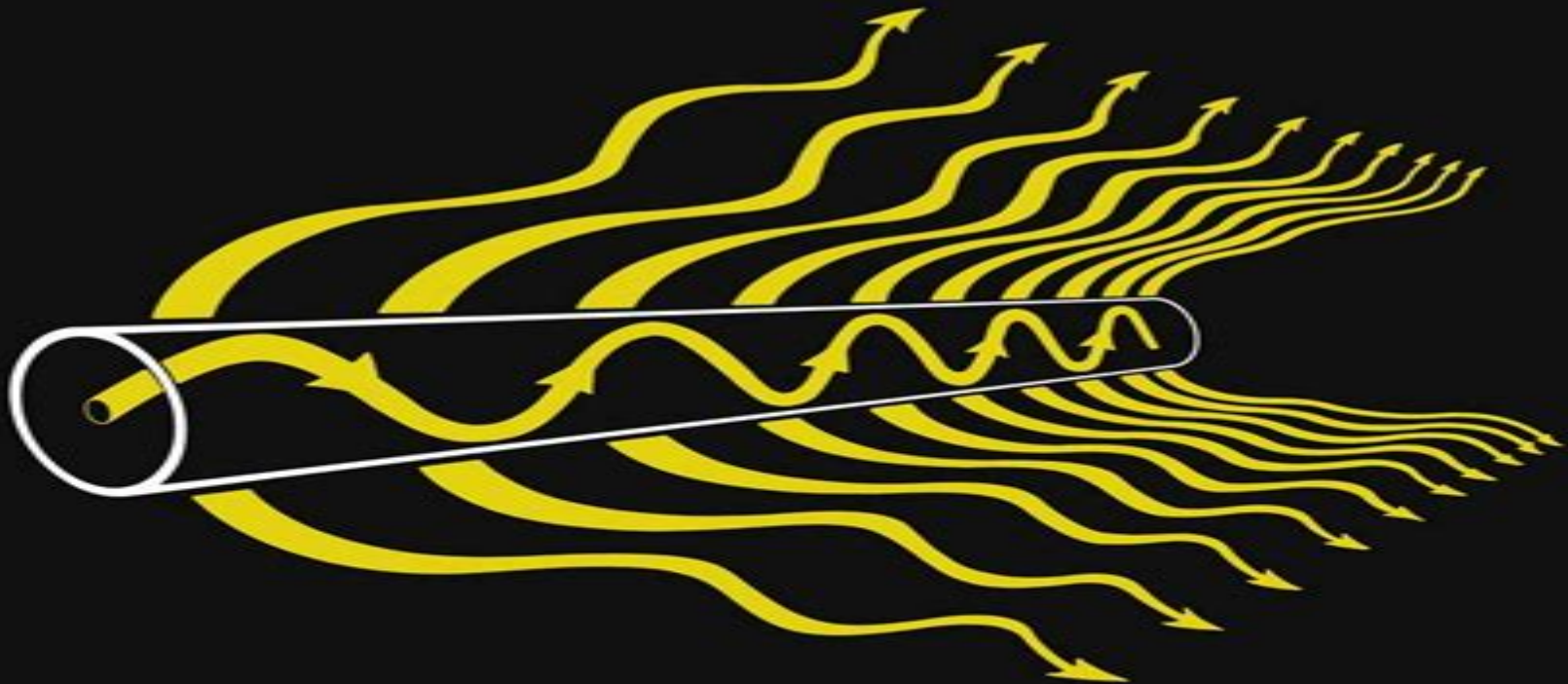


# Optical Waveguide Theory

Allan W. Snyder *and* John D. Love



# Optical Waveguide Theory

**Dietrich Marcuse**



## **Optical Waveguide Theory:**

Optical Waveguide Theory A.W. Snyder, J. Love, 1983-11-30 This is a comprehensive treatment of optical waveguide theory     *Optical Waveguide Theory* Allan W. Snyder, John D. Love, 1991     **Optical Waveguide Theory** A.W. Snyder, J. Love, 2011-10-12 This text is intended to provide an in depth self contained treatment of optical waveguide theory We have attempted to emphasize the underlying physical processes stressing conceptual aspects and have developed the mathematical analysis to parallel the physical intuition We also provide comprehensive supplementary sections both to augment any deficiencies in mathematical background and to provide a self consistent and rigorous mathematical approach To assist in understanding each chapter concentrates principally on a single idea and is therefore comparatively short Furthermore over 150 problems with complete solutions are given to demonstrate applications of the theory Accordingly through simplicity of approach and numerous examples this book is accessible to undergraduates Many fundamental topics are presented here for the first time but more importantly the material is brought together to give a unified treatment of basic ideas using the simplest approach possible To achieve such a goal required a maturation of the subject and thus the text was intentionally developed over a protracted period of the last 10 years     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     Theory of Dielectric Optical Waveguides Dietrich Marcuse, 2013-09-11 *Theory of Dielectric Optical Waveguides*     **Optical Waveguide Theory** Allan W. Snyder, J. Love, 2009-02 This title concentrates on powerful nonlinear situations when light guides itself in a homogenous medium without any intervening core cladding structure Its purpose is to impart the key concepts necessary to appreciate how to apply elementary wave guide theory to understand some of the more exciting recent advances     **Optical Waveguide Theory by the Finite Element Method** Masanori Koshiba, 1993 Recent advances in the field of guided wave

optics such as fibre optics and integrated optics have included the introduction of various optical waveguides Computational tools for modelling and simulation are essential for a successful design optimization and realization of the optical waveguides Despite its relatively brief existence the finite element method has grown into a powerful and efficient tool for solving the most general optical waveguide problems In this book starting with a brief review of electromagnetic theory for optical waveguide analysis the concepts of the finite element method and its fundamentals are discussed in detail Current topics of the application of the finite element method to various optical waveguide problems such as planar optical waveguides optical channel waveguides optical fibres polarization maintaining optical fibres optical gratings optical waveguide discontinuities nonlinear optical waveguides optical solitons and quantum well structures are described including many illustrations

**Optical Waveguide Theory by the Finite Element Method** Masanori Koshihara, 2014-01-14 Recent advances in the field of guided wave optics such as fiber optics and integrated optics have included the introduction of arbitrarily shaped optical waveguides which in many cases also happened to be arbitrarily inhomogeneous dissipative anisotropic and or nonlinear Most of such cases of waveguide arbitrariness do not lend themselves to analytical solutions hence computational tools for modeling and simulation are essential for successful design optimization and realization of the optical waveguides For this purpose various numerical techniques have been developed In particular the finite element method FEM is a powerful and efficient tool for the most general i.e. arbitrarily shaped inhomogeneous dissipative anisotropic and nonlinear optical waveguide problem Its use in industry and research is extensive and indeed it could be said that without it many optical waveguide problems would be incapable of solution This book is intended for students engineers designers and technical managers interested in a detailed description of the FEM for optical waveguide analysis Starting from a brief review of electromagnetic theory the first chapter provides the concepts of the FEM and its fundamentals In addition to conventional elements i.e. line elements triangular elements tetrahedral elements ring elements and triangular ring elements which are utilized for one dimensional two dimensional three dimensional axisymmetric two dimensional and axisymmetric three dimensional problems respectively special purpose elements such as isoparametric elements edge elements infinite elements and boundary elements are also introduced

Introduction to Optical Waveguide Analysis Kenji Kawano, Tsutomu Kitoh, 2004-03-22 A complete survey of modern design and analysis techniques for optical waveguides This volume thoroughly details modern and widely accepted methods for designing the optical waveguides used in telecommunications systems It offers a straightforward presentation of the sophisticated techniques used in waveguide analysis and enables a quick grasp of modern numerical methods with easy mathematics The book is intended to guide the reader to a comprehensive understanding of optical waveguide analysis through self study This comprehensive presentation includes An extensive and exhaustive list of mathematical manipulations Detailed explanations of common design methods finite element method FEM finite difference method FDM beam propagation method BPM and finite difference time domain method FD

TDM Explanations for numerical solutions of optical waveguide problems with sophisticated techniques used in modern computer aided design CAD software Solutions to Maxwell s equations and the Schrodinger equation The authors provide excellent self study material for practitioners researchers and students while also presenting detailed mathematical manipulations that can be easily understood by readers who are unfamiliar with them Introduction to Optical Waveguide Analysis presents modern design methods in a comprehensive and easy to understand format *Optical Waveguide Concepts* Charles Vassallo,1991-01-01 Hardbound This book is the first volume to appear in the new series Optical Wave Sciences and Technology It provides a comprehensive review on recent trends in optical waveguide theory The main focus of the work is on single mode optics examining in turn the basic tools the derivation of normal modes the perturbation problems and finally the discontinuity problems This new book series which is open ended is aimed at scientists working in the field of electromagnetic theory and its applications Maxwell s equations will form the ultimate basis either explicitly or implicitly of every book in the series *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 **Optical Waveguide Theory and Numerical Modelling** Wilfrid W. Pascher,Stenfan F. Helfert,2002 *Theory of Dielectric Optical Waveguides 2e* Paul Liao,2012-12-02 Theory of Dialectric Optical Waveguides Second Edition focuses on the practical usage of optical waveguides This book explores the rapid growth of integrated optics which is devoted to the development of microscopic optical circuits based on thin film technology Organized into nine chapters this edition starts with an overview of the properties of dielectric slab waveguides This book then examines the theory of directional couplers with and without diffraction gratings Other chapters describe the numerical methods for solving guided mode as well as wave propagation problems This text discusses as well the beam propagation method and the popular effective refractive index method The final chapter deals with the significance of nonlinear phenomena This book is a

valuable resource for undergraduate and graduate students of physics and electrical engineering Practicing engineers and scientists in the fields of integrated optics optical communications and fiber sensors will find this book extremely useful

**Seventh International Workshop on Optical Waveguide Theory and Numerical Modelling** Olivier M.

Parriaux, Jean-Pierre Meunier, 2000

**Proceedings of the international workshop on optical waveguide theory** Allan

Snyder, 1977

**Fundamentals of Optical Waveguides** Katsunari Okamoto, 2010-08-04 Fundamentals of Optical

Waveguides is an essential resource for any researcher professional or student involved in optics and communications

engineering Any reader interested in designing or actively working with optical devices must have a firm grasp of the principles of lightwave propagation Katsunari Okamoto has presented this difficult technology clearly and concisely with several illustrations and equations Optical theory encompassed in this reference includes coupled mode theory nonlinear optical effects finite element method beam propagation method staircase concatenation method along with several central theorems and formulas Since the publication of the well received first edition of this book planar lightwave circuits and photonic crystal fibers have fully matured With this second edition the advances of these fibers along with other

improvements on existing optical technologies are completely detailed This comprehensive volume enables readers to fully analyze design and simulate optical atmospheres Exceptional new chapter on Arrayed Waveguide Grating AWG In depth discussion of Photonic Crystal Fibers PCFs Thorough explanation of Multimode Interference Devices MMI Full coverage of polarization Mode Dispersion PMD **Optical Waveguide Theory and Numerical Modelling** Wilfrid W. Pascher, Stenfan

F. Helfert, 1999 **Differential Topology of Complex Surfaces** John W. Morgan, Kieran G. O'Grady, Millie Niss, 1993

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**Waveguide Theory and Numerical Modelling**, 2005

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