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Nota di contenuto	Nanostructuredand SubwavelengthWaveguides; Contents; Series Preface; Preface; 1 Introduction; 1.1 Contents and Organisation of the Book; 1.2 Step-Index Subwavelength Waveguides Made of Isotropic Materials; 1.3 Field Enhancement in the Low Refractive Index Discontinuity Waveguides; 1.4 Porous Waveguides and Fibres; 1.5 Multifilament Core Fibres; 1.6 Nanostructured Waveguides and Effective Medium Approximation; 1.7 Waveguides Made of Anisotropic Materials; 1.8 Metals and Polar Materials; 1.9 Surface Polariton Waves on Planar and Curved Interfaces; 1.9.1 Surface Waves on Planar Interfaces 1.9.2 Surface Waves on Wires1.9.3 Plasmons Guided by Metal Slab Waveguides; 1.9.4 Plasmons Guided by Metal Slot Waveguides; 1.10 Metal/Dielectric Metamaterials and Waveguides Made of Them; 1.11 Extending Effective Medium Approximation to Shorter Wavelengths; 2 Hamiltonian Formulation of Maxwell Equations for the Modes of

Anisotropic Waveguides; 2.1 Eigenstates of a Waveguide in Hamiltonian Formulation; 2.2 Orthogonality Relation between the Modes of a Waveguide Made of Lossless Dielectrics; 2.3 Expressions for the Modal Phase Velocity; 2.4 Expressions for the Modal Group Velocity; 2.5 Orthogonality Relation between the Modes of a Waveguide Made of Lossy Dielectrics; 2.6 Excitation of the Waveguide Modes; 2.6.1 Least Squares Method; 2.6.2 Using Flux Operator as an Orthogonal Dot Product; 2.6.3 Coupling into a Waveguide with Lossless Dielectric Profile; 2.6.4 Coupling into a Waveguide with Lossy Dielectric Profile; 3 Wave Propagation in Planar Anisotropic Multilayers, Transfer Matrix Formulation; 3.1 Planewave Solution for Uniform Anisotropic Dielectrics; 3.2 Transfer Matrix Technique for Multilayers Made from Uniform Anisotropic Dielectrics; 3.2.1 TE Multilayer Stack; 3.2.2 TM Multilayer Stack; 3.3 Reflections at the Interface between Isotropic and Anisotropic Dielectrics; 4 Slab Waveguides Made from Isotropic Dielectric Materials. Example of Subwavelength Planar Waveguides; 4.1 Finding Modes of a Slab Waveguide Using Transfer Matrix Theory; 4.2 Exact Solution for the Dispersion Relation of Modes of a Slab Waveguide; 4.3 Fundamental Mode Dispersion Relation in the Long-Wavelength Limit; 4.4 Fundamental Mode Dispersion Relation in the Short-Wavelength Limit; 4.5 Waveguides with Low Refractive-Index Contrast; 4.6 Single-Mode Guidance Criterion; 4.7 Dispersion Relations of the Higher-Order Modes in the Vicinity of their Cutoff Frequencies; 4.8 Modal Losses Due to Material Absorption; 4.8.1 Waveguides Featuring Low Loss-Dispersion; 4.8.2 Modal Losses in a Waveguide with Lossless Cladding; 4.8.3 Modal Losses in a Waveguide with Low Refractive-Index Contrast; 4.9 Coupling into a Subwavelength Slab Waveguide Using a 2D Gaussian Beam; 4.9.1 TE Polarisation; 4.9.2 TM Polarisation; 4.10 Size of a Waveguide Mode; 4.10.1 Modal Size of the Fundamental Modes of a Slab Waveguide in the Long-Wavelength Limit; 4.10.2 Modal Size of the Fundamental Modes of a Slab Waveguide in the Short-Wavelength Limit

## Sommario/riassunto

"This book presents semi-analytical theory and practical applications of a large number of subwavelength and nanostructured optical waveguides. The contents are organized around four major themes: guidance properties of subwavelength waveguides made of homogeneous anisotropic materials; description of guidance by nanostructured waveguides using effective media approximation; operation of nanostructured waveguides at shorter wavelength at the limit of validity of effective medium approximation; and practical applications of subwavelength and nanostructured waveguides. What makes the book unique is that it collects in a single place a large number of analytical solutions which are derived in a long wavelength regime for a plethora of practically important waveguides and fibers than researchers currently use or study worldwide. The waveguides considered include planar and circular isotropic and anisotropic waveguides, as well as surface waves on planar, and circular surfaces, and the waveguide materials include dielectrics, metals and polar materials. After analysis of the basic waveguide structures it considers waveguides made of the nanostructured materials. Many practical applications are then rigorously detailed including low-loss low-dispersion guidance using porous THz waves, long-range propagation of plasmons in thin metallic films, and leakage spectroscopy of leaky plasmonic modes propagating on thin metallic films. A companion website (password-protected) provides a fully functional transfer matrix code PolyTMat (Matlab) which is able to treat any multilayer waveguide of planar or circular geometry made of anisotropic

dielectrics. "--

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