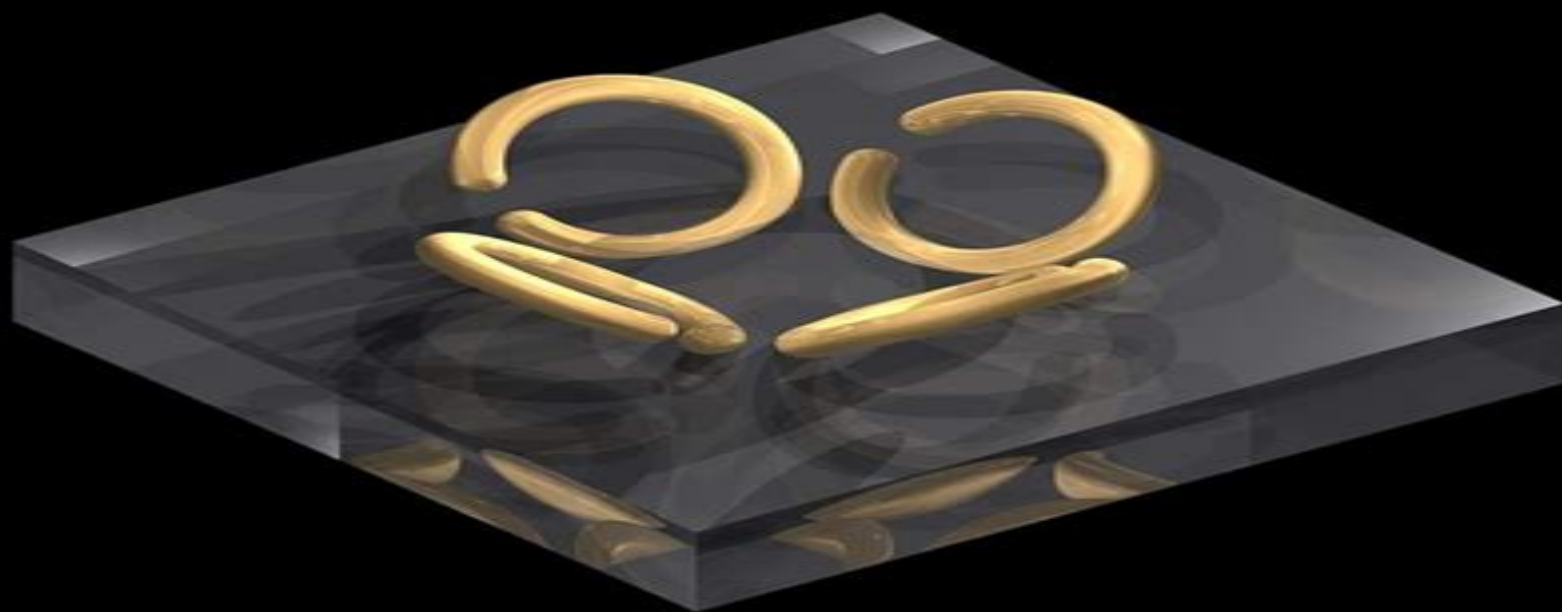


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Tutorials In Metamaterials Series In Nano Optics And Nanophotonics

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Time-Domain Finite Element Methods for Maxwell's Equations in Metamaterials Jichun Li, Yunqing Huang, 2012-12-15 The purpose of this book is to provide an up to date introduction to the time domain finite element methods for Maxwell s equations involving metamaterials Since the first successful construction of a metamaterial with both negative permittivity and permeability in 2000 the study of metamaterials has attracted significant attention from researchers across many disciplines Thanks to enormous efforts on the part of engineers and physicists metamaterials present great potential applications in antenna and radar design sub wavelength imaging and invisibility cloak design Hence the efficient simulation of electromagnetic phenomena in metamaterials has become a very important issue and is the subject of this book in which various metamaterial modeling equations are introduced and justified mathematically The development and practical implementation of edge finite element methods for metamaterial Maxwell s equations are the main focus of the book The book finishes with some interesting simulations such as backward wave propagation and time domain cloaking with metamaterials

An Introduction to Metamaterials and Nanophotonics Constantin Simovski, Sergei Tretyakov, 2020-11-26 Metamaterials have established themselves as one of the most important topics in physics and engineering and have found practical application across a wide variety of fields including photonics condensed matter physics materials science and biological and medical physics This modern and self contained text delivers a pedagogical treatment of the topic rooted within the fundamental principles of nanophotonics A detailed and unified description of metamaterials and metasurfaces is developed beginning with photonic crystals and their underlying electromagnetic properties before introducing plasmonic effects and key metamaterial configurations Recent developments in research are also presented along with cutting edge applications in the field This advanced textbook will be invaluable to students and researchers working in the fields of optics and nanophotonics

Nanophotonics Arthur McGurn, 2018-04-27 This book gives a readable introduction to the important rapidly developing field of nanophotonics It provides a quick understanding of the basic elements of the field allowing students and newcomers to progress rapidly to the frontiers of their interests Topics include The basic mathematical techniques needed for the study of the materials of nanophotonic technology

photonic crystals and their applications as laser resonators waveguides and circuits of waveguides the application of photonic crystals technology in the design of optical diodes and transistors the basic properties needed for the design and understanding of new types of engineered materials known as metamaterials and a consideration of how and why these engineered materials have been formulated in the lab as well as their applications as negative refractive index materials as perfect lens as cloaking devices and their effects on Cherenkov and other types of radiation Additionally the book introduces the new field of plasmonics and reviews its important features The role of plasmon polaritons in the scattering and transmission of light by rough surfaces and the enhanced transmission of light by plasmon polariton supporting surfaces is addressed The important problems of subwavelength resolution are treated with discussions of applications in a number of scientific fields The basic principles of near field optical microscopy are presented with a number of important applications The basics of atomic cavity physics photonic entanglement and its relation to some of the basic properties of quantum computing and the physics associated with the study of optical lattices are presented

Fourier Modal Method and Its Applications in Computational Nanophotonics Hwi Kim,Junghyun Park,Byoungho Lee,2017-12-19 Most available books on computational electrodynamics are focused on FDTD FEM or other specific technique developed in microwave engineering In contrast Fourier Modal Method and Its Applications in Computational Nanophotonics is a complete guide to the principles and detailed mathematics of the up to date Fourier modal method of optical analysis It takes readers through the implementation of MATLAB codes for practical modeling of well known and promising nanophotonic structures The authors also address the limitations of the Fourier modal method Features Provides a comprehensive guide to the principles methods and mathematics of the Fourier modal method Explores the emerging field of computational nanophotonics Presents clear step by step practical explanations on how to use the Fourier modal method for photonics and nanophotonics applications Includes the necessary MATLAB codes enabling readers to construct their own code Using this book graduate students and researchers can learn about nanophotonics simulations through a comprehensive treatment of the mathematics underlying the Fourier modal method and examples of practical problems solved with MATLAB codes

Metamaterials And Nanophotonics: Principles, Techniques And Applications Kosmas L Tsakmakidis,Konstantinos G Baskourellos,Marek S Wartak,2022-08-11 This monograph is a detailed introduction to the nascent and ever evolving fields of metamaterials and nanophotonics with key techniques and applications needed for a comprehensive understanding of these fields all detailed These include the standard and high accuracy nonstandard FDTD techniques finite difference frequency domain mode solvers the transfer matrix method analytic calculations for dielectric and plasmonic waveguides dispersion Maxwell Bloch and density functional theory as well as design methods for constructing metamaterials and nanolasers and quantum plasmonics The book is intended for final year undergraduates as well as postgraduates or active researchers who wish to understand and enter these fields in a user friendly manner and who have a basic understanding of and familiarity with

electromagnetic theory **Fundamentals and Applications of Nanophotonics** Joseph W. Haus, 2016-01-09 Fundamentals and Applications of Nanophotonics includes a comprehensive discussion of the field of nanophotonics including key enabling technologies that have the potential to drive economic growth and impact numerous application domains such as ICT the environment healthcare military transport manufacturing and energy This book gives readers the theoretical underpinnings needed to understand the latest advances in the field After an introduction to the area chapters two and three cover the essential topics of electrodynamics quantum mechanics and computation as they relate to nanophotonics Subsequent chapters explore materials for nanophotonics including nanoparticles photonic crystals nanosilicon nanocarbon III V and II VI semiconductors In addition fabrication and characterization techniques are addressed along with the importance of plasmonics and the applications of nanophotonics in devices such as lasers LEDs and photodetectors Covers electrodynamics quantum mechanics and computation as these relate to nanophotonics Reviews materials fabrication and characterization techniques for nanophotonics Describes applications of the technology such as lasers LEDs and photodetectors **VLSI Micro- and Nanophotonics** El-Hang Lee, Louay Eldada, Manijeh Razeghi, Chennupati Jagadish, 2018-09-03 Addressing the growing demand for larger capacity in information technology VLSI Micro and Nanophotonics Science Technology and Applications explores issues of science and technology of micro nano scale photonics and integration for broad scale and chip scale Very Large Scale Integration photonics This book is a game changer in the sense that it is quite possibly the first to focus on VLSI Photonics Very little effort has been made to develop integration technologies for micro nanoscale photonic devices and applications so this reference is an important and necessary early stage perspective on this field New demand for VLSI photonics brings into play various technological and scientific issues as well as evolutionary and revolutionary challenges all of which are discussed in this book These include topics such as miniaturization interconnection and integration of photonic devices at micron submicron and nanometer scales With its disruptive creativity and unparalleled coverage of the photonics revolution in information technology this book should greatly impact the future of micro nano photonics and IT as a whole It offers a comprehensive overview of the science and engineering of micro nanophotonics and photonic integration Many books on micro nanophotonics focus on understanding the properties of individual devices and their related characteristics However this book offers a full perspective from the point of view of integration covering all aspects of benefits and advantages of VLSI scale photonic integration the key technical concept in developing a platform to make individual devices and components useful and practical for various applications Dispersion Engineering for Integrated Nanophotonics Olivier Vanbésien, Emmanuel Centeno, 2014-03-06 This book shows how dispersion engineering in two dimensional dielectric photonic crystals can provide new effects for the precise control of light propagation for integrated nanophotonics Dispersion engineering in regular and graded photonic crystals to promote anomalous refraction effects is studied from the concepts to experimental demonstration via nanofabrication considerations Self collimation ultra

and negative refraction second harmonic generation mirage and invisibility effects which lead to an unprecedented control of light propagation at the sub wavelength scale for the field of integrated nanophotonics are detailed and commented upon

Semiconductor Nanophotonics Prasanta Kumar Basu, Bratati Mukhopadhyay, Rikmantra Basu, 2022 One of the first comprehensive textbooks dealing with the modern field of Nanophotonics Though emphasis is given on semiconductors optical processes in metals and insulators are discussed as well Provides basic theoretical models in simple terms and discusses the application areas

Introduction to Nanophotonics Henri Benisty, Jean-Jacques Greffet, Philippe Lalanne, 2022 This book provides an introduction to nanophotonics a newly emerged and rapidly evolving field combining optics quantum physics material sciences and electrical engineering It illustrates the theoretical foundations as well as the major advances in the field based on artificial metallic and dielectric nanostructures

Nanostructures and Nanotechnology Douglas Natelson, 2015-06-18 A carefully developed textbook focusing on the fundamental principles of nanoscale science and nanotechnology

The Photonic Hook Oleg V. Minin, Igor V. Minin, 2021-03-31 This book describes the recently discovered artificially curved light beam known as the photonic hook Self bending of light a long time goal of optical scientists was realized in 2007 with the Airy beam followed by the first demonstration of the photonic hook by the authors of this book and their collaborators in 2015 and experimentally in 2019 The photonic hook has curvature less than the wavelength along with other unique features described in this book that are not shared by Airy like beams and so deepens our understanding of light propagation This book discusses the general principles of artificial near field structured curved light and the full wave simulations of the photonic hook along with their experimental confirmation The book goes on to show how the photonic hook has implications for acoustic and surface plasmon waves and as well as applications in nanoparticle manipulation

Handbook of Nano-Metamaterials Balamati Choudhury, Vinod K. Tewary, Krushna Kanth Varikuntla, 2025-04-12 This handbook is intended to serve as a comprehensive reference work on nano metamaterials The book covers an array of topics on nano metamaterials from theoretical modeling to fabrication and from measurement techniques to applications The book comprises contributions by pioneers and leaders in the field of nanotechnology aspects of metamaterials This volume is part of a larger reference series covering all aspects of metamaterials science and technology The contents of this volume will be of use to researchers in academia and critical industrial sectors such as aerospace satellite communications and defense

Disruptive and Game Changing Technologies in Modern Warfare Margaret E. Kosal, 2019-09-27 This book explores and analyzes emerging innovations within today's most cutting edge science and technology S how these impact science and technology policy choices made today and predictions of how science and technology may play a beneficial or deleterious role in the future Some game changing technologies have received global attention while others may be less well known the new technologies discussed within this proposal as well as future discoveries may significantly alter military capabilities and may generate new threats against military and civilian sectors

Nanoscience with Liquid Crystals Quan Li, 2014-04-17 This

book focuses on the exciting topic of nanoscience with liquid crystals from self organized nanostructures to applications The elegant self organized liquid crystalline nanostructures the synergetic characteristics of liquid crystals and nanoparticles liquid crystalline nanomaterials synthesis of nanomaterials using liquid crystals as templates nanoconfinement and nanoparticles of liquid crystals are covered and discussed and the prospect of fabricating functional materials is highlighted Contributions collecting the scattered literature of the field from leading and active players are compiled to make the book a reference book Readers will find the book useful and of benefit both as summaries for works in this field and as tutorials and explanations of concepts for those just entering the field Additionally the book helps to stimulate future developments

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Fundamentals of the Optics of Materials Vladimir I. Gavrilenko,Volodymyr S. Ovechko,2023-10-19 This textbook showcases the rapidly developing field of materials optics It is aimed at a broad audience as the readers require only university entry level knowledge of physics chemistry and optics It overviews the basics of optical engineering and the typical and widely used applications of materials optics with the first general chapters corresponding to the standard university courses targeting bachelor s and master s degrees in physics The next few chapters present the modern developments in materials optics such as nano plasmonics nano photonics and optical properties of nano sized materials intended for readers familiar with the basic elements of quantum mechanics Some more specialized chapters address recent developments in fields such as optics of solid surfaces plasma optics optics of composites alloys and metamaterials optics of anisotropic materials optics of organic and biological materials and relativistic effects in optics The appendices present a more advanced description of selected topics with important reference materials subject index and extended list of publications as well as numerous examples and problems to better orient readers interested in gaining further knowledge of the subject

Frontiers in Optics and Photonics Federico Capasso,Dennis Couwenberg,2021-06-08 This book provides a cutting edge research overview on the latest developments in the field of Optics and Photonics All chapters are authored by the pioneers in their field and will cover the developments in Quantum Photonics Optical properties of 2D Materials Optical

Sensors Organic Opto electronics Nanophotonics Metamaterials Plasmonics Quantum Cascade lasers LEDs Biophotonics and biomedical photonics and spectroscopy

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