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Integrated Optics Theory And Technology

INTEGRATED OPTICS. Term integrated optics means implementation of the optical properties on single substrate. Similar than electric integrated circuit (IC-circuit), PIC - Photonic Integrated Circuit. Several different materials and material combinations available for integrated optics. The main structure is waveguide, which is used to guide and manipulate light signal.

INTEGRATED OPTICS - University of Oulu

As in the previous editions, detailed descriptions of the phenomena, devices, and technology used in optical integrated circuits and their relationship to fiber optics are presented. The trend of telecommunications toward the use of single mode systems operating at the longer wavelengths of 1.3 and 1.55 μm is explained and documented with illustrations of recently developed devices and systems.

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integrated optics theory and technology explains the subject of optoelectronic devices and their use in integrated optics and fiber optic systems the text emphasizes the physics of how devices work and how they can be used in various applications we describe the packaging technology of a 32 ch high speed optical wavelength selector

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.

This book is an introduction to the theory and technology of integrated optics for graduate students in electrical engineering, and for practicing engineers and scientists who wish to improve their understanding of the principles and applications of this relatively new, and rapidly growing, field. Integrated Optics is the name given to a new generation of opto-electronic systems in which the familiar wires and cables are replaced by light waveguiding optical fibers, and conventional integrated circuits are replaced by optical integrated circuits (OIC's). In an OIC, the signal is carried by means of a beam of light rather than by an electrical current, and the various circuit elements are interconnected on the substrate wafer by optical wave guides. Some advantages of an integrated-optic system are reduced weight, increased bandwidth (or multiplexing capability), resistance to electromagnetic interference, and low loss signal transmission. Because of the voluminous work that has been done in the field of integrated optics since its inception in the late 1960's, the areas of fiber optics and optical integrated circuits have usually been treated separately at conferences and in textbooks. In the author's opinion, this separation is unfortunate because the two areas are closely related. Nevertheless, it cannot be denied that it may be a practical necessity.

Integrated Optics: Theory and Technology provides a comprehensive and thorough treatment suitable for use both as a classroom text (practice problems are included) and as a specialist's reference. Detailed descriptions of the phenomena, devices, and technology used in optical integrated circuits and their relationship to fiber optics are presented. In this fourth edition all chapters have been completely revised.

Our intent in producing this book was to provide a text that would be comprehensive enough for an introductory course in integrated optics, yet concise enough in its mathematical derivations to be easily readable by a practicing engineer who desires an overview of the field. The response to the first edition has indeed been gratifying; unusually strong demand has caused it to be sold out during the initial year of publication, thus providing us with an early opportunity to produce this updated and improved second edition. This development is fortunate, because integrated optics is a very rapidly progressing field, with significant new research being regularly reported. Hence, a new chapter (Chap. 17) has been added to review recent progress and to provide numerous additional references to the relevant technical literature. Also, thirty-five new problems for practice have been included to supplement those at the ends of chapters in the first edition. Chapters I through 16 are essentially unchanged, except for brief updating revisions and corrections of typographical errors. Because of the time limitations imposed by the need to provide an uninterrupted supply of this book to those using it as a course text, it has been possible to include new references and to briefly describe recent developments only in Chapter 17. However, we hope to provide details of this continuing progress in a future edition.

Proceedings of SPIE present the original research papers presented at SPIE conferences and other high-quality conferences in the broad-ranging fields of optics and photonics. These books provide prompt access to the latest innovations in research and technology in their respective fields. Proceedings of SPIE are among the most cited references in patent literature.

This book covers the technology of switching or modulating light in semiconductor optical waveguides. Currently a key function for optical communications systems is the conversion of data from an electrical signal to an optical signal for transmission in very low loss optical fibres and the converse process of optical to electrical conversion the O/E/O data conversion. This conversion between electronic and photonic signals imposes an energy consumption overhead on optical communication systems. So many research workers have been attracted to ultrafast all-optical switching of data in different formats. As a way of introduction to all-optical switching in semiconductor waveguides the book covers the electro-optic effect, electroabsorption and electrorefraction; effects that can be used in semiconductor optical modulation devices. But the book focuses on all-optical switching using second and third order optical nonlinearities in AlGaAs optical waveguides. It covers a variety of device configurations including integrated nonlinear couplers and Mach-Zehnder interferometers. Further, it provides design software in suit of Mathematica notebooks that can be used to explore the device design.

Integrated Optics: Theory and Technology provides a comprehensive and thorough treatment suitable for use both as a classroom text (practice problems are included) and as a specialist's reference. Detailed descriptions of the phenomena, devices, and technology used in optical integrated circuits and their relationship to fiber optics are presented. In this fourth edition all chapters have been completely revised.

Controlling the mechanical, electrical, magnetic, and optical properties of materials by advanced fabrication methods (Le. ; Molecular Beam Epitaxy and Metal-Organic Chemical Vapor Deposition) has become the new paradigm in our research era. Sensors, being the most vital part of the electronic data processing and decision making machines, stand to gain the most from engineering of the properties of materials. Microfabrication technology has already contributed significantly to the batch fabrication of micro-sensors with higher over all qualities compared to their counterparts that are fabricated using other methods. Batch fabrication of micro-sensors i) results in more uniform properties of co-fabricated devices, ii) nearly eliminates the need for characterization of individual sensors, and iii) eliminates a need for laborious alignment procedures. A less obvious benefit of using microfabrication methods is the possibility of precise control over the dimensions of the sensor. This control enables engineering of some of the properties of the material which affect the sensor's operation. There are many examples of this in the literature. Optical sensors are known to have superior properties over their counterparts that use other (i. e. ; electrostatic and magnetic) means of detection. To name a few, these advantages are: i) immunity to electromagnetic interferences, ii) higher sensitivities compared to the other types of sensors, iii) simplicity of operation principles, and iv) simplicity of overall construction.

This volume contains the Proceedings of a two-week summer conference titled "Advances in Integrated Optics" held June 1-9, 1993, in Erice, Sicily. This was the 18th annual course organized by the International School of Quantum Electronics, under the auspices of the "Ettore Majorana" Centre for Scientific Culture. The term Integrated Optics signifies guided-wave optical circuits consisting of two or more devices on a single substrate. Since its inception in the late 1960's, Integrated Optics has evolved from a specialized research topic into a broad field of work, ranging from basic research through commercial applications. Today many devices are available on market while a big effort is devolved to research on integrated nonlinear optical devices. This conference was organized to provide a comprehensive survey of the frontiers of this technology, including fundamental concepts, nonlinear optical materials, devices both in the linear and nonlinear regimes, and selected applications. These Proceedings update and augment the material contained in a previous ISQE volume, "Integrated Optics: Physics and Applications", S. Martellucci and A. N. Chester, Eds. , NATO ASI Series B, Vol. 91 (Plenum, 1983). For some closely related technology, the reader may also wish to consult the ISQE volumes: "Optical Fiber Sensors", A. N. Chester, S. Martellucci and A. M. Scheggi, Eds. , NATO ASI Series E, Vol. 132 (Nijhoff, 1987) ; and, "Nonlinear Optics and Optical Computing", S. Martellucci and A. N. Chester, Eds. , E. Majorana Int'l Science Series, Vol. 49 (plenum, 1990).

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