DEPARTMENTS

BOOK REVIEWS

Optical Methods for Information Technologies

Andrei L. Mikaelian, iii + 247 pp., illus., and references. ISBN 0-89864-070-9. Allerton Press, Inc., 150 Fifth Avenue, New York, NY 10011 (1994) $37.50 hardbound.

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This book covers some very important optical methods used in information technologies. The role of geometrical and physical optics techniques in data transmission, processing, and storage is covered in the book.

The book consists of three parts with a total of nine chapters. The first part (Chaps. 1 and 2) deals with geometrical optical methods for inverse problems on propagation in inhomogeneous focusing media. Numerous mathematical tools are covered in a very informative and convincing form. It would have been better if some applications (p. 26) were presented in more detail rather than just being mentioned. Nevertheless, the chapters are very successful in presenting the mathematical tools for gradient-index optics in a simple fashion. Thus, they are very useful to those who are not necessarily active researchers in this area but still need to know the basic analytical principles.

The next part (Chaps. 3 through 6) covers diffraction methods dealing with wavefront transformation by diffraction. Chapter 3 is more or less the common diffraction theory treatment found in optics books. It would have been better in the end (or somewhere later in Chap. 6) if the discussion on arbitrarily shaped apertures also included fractal structures. Chapter 4 covers optical cavity theory, which is necessary for the discussion of lasers. In the beginning of the chapter, many results are given background material; however, the chapter becomes more comprehensive after Sec. 4.1. Chapter 5 covers Fourier analysis techniques. These methods, commonly covered in the physical optics literature, are very appropriate in this small chapter. Chapter 6 deals with multielement diffraction structures, i.e., diffraction gratings (one- and two-dimensional), acoustic waves, volume phase gratings, reflection gratings, etc. Thus, this chapter is basically an outgrowth of Chap. 3, although it is presented in a rather independent manner.

The last part (Chaps. 7, 8, and 9) covers the information aspects of holography. Chapter 7 describes basic holographic methods, whereas Chap. 8 begins with an emphasis on practical problems such as resolution power and the effect of wavelength changes. Next, techniques for information storage, retrieval, recognition, and holographic associative memory are discussed. Finally, the information capacity of holograms (thin as well as volume) is covered. Chapter 9 covers holographic methods in optical memory systems. It begins by considering the practical advantages of holographic methods in information technology. Next, the principles of operation of optical disks are described in a very simple but useful manner. Finally the role of holography in these systems is covered and several practical aspects are described in detail with sketches of actual systems. This simple chapter alone justifies the need for this book.

The figures are without captions throughout the book. Some notation is different from traditional western notation (such as 'rot' on p. 1). The list of references is very limited and there is no index. In spite of these drawbacks, the book is a very valuable reference to optical information technologists and holographers. There is enough quality and quantity of material for a textbook (the book is actually based on a lecture course), general background for a researcher, and very useful information for a technologist in the industry. The book is a welcome and useful addition to the optoelectronics literature.

BOOKS RECEIVED

Fundamentals of Laser Optics, by Kenichi Iga, edited by Richard B. Miles. xv + 285 pp., illus., subject index, references and problems following each chapter. From the Lasers, Photonics, and Electro-Optics series. ISBN 0-306-44604-9. Plenum Press, 233 Spring Street, New York, NY 10013 (1994) $49.50 hardbound. The purpose of this book is to describe the principles of lasers and the behavior of laser beams optically. It is these fundamental concepts that are required in applications for the utilization of lasers. In other words, the goal is to introduce the basic concepts of lasers that need to be understood for industrial laser use. This book is written for students at the junior and senior level of science and engineering schools, for graduate students, and for researchers who plan to be involved with the optoelectronics field.