Book Review

Introduction to Micro- and Nanooptics

Jürgen Jahns and Stefan Helfert, Wiley-VCH, 1st edition (July 17, 2012), $65.00, paperback 448 pages, physics textbook, ISBN: 978-3527408917.

This book is a textbook mainly for graduate or PhD physics and engineering students. However, scientists from other fields or engineers in the industry may also benefit from it.

The title *Introduction to Micro- and Nanoptics* already implies three aspects.

First, it is an 'Introduction', meaning it is a textbook and not a monograph. Thus, the authors address their book not necessarily to an expert in the field but rather to a graduate student or a reader who wants to get an insight into this new and challenging field.

Second, the book focuses on 'Microoptics'. For more than 30 years, this optical subdomain is known. However, among physicists and engineers, the rules and tools to design, to dimension, and to fabricate microoptical elements are not as established as the potential of these devices might imply.

Third, the authors also dedicate their publication to 'Nanooptics'. This last aspect indicates that the field of photonics has profited from new results in nanotechnology. Here, even more than in microoptics, at this order of magnitude, more knowledge about the physics- and engineering-specific aspects is required.

In short, it is a quite smart but also challenging approach to combine these three aspects in one textbook.

The paperback edition is divided into 14 chapters, each of which is completed with a short list of questions and problems to be solved to give a deeper understanding.

Starting with preliminaries such as the mathematical basics of Fourier optics and Maxwell's equations, the book continues with chapters on light propagation, light as carrier of information and energy, and light propagation in free space. Thus, the introductive aspect is fulfilled. Chapters 5 and 6 focus on refractive and diffractive optical elements, respectively, whereas the next couple of chapters deal with micro- and nanofabrication, tunable microoptics, as well as compound and integrated free-space optics. Together with the chapters on light propagation in waveguides and integrated waveguide optics, the reader gets a comprehensive overview of all aspects of microopotics. The last few chapters then address specific nanooptical issues such as plasmonics, photonic crystals, or lefthanded materials.

The layout is functional and sober, as one expects from physics textbooks. The same applies to the figures and graphics which are all kept clear in grayscale and monochrome. It should be noted that, throughout the whole book, Jahns and Helfert consistently used the same symbols in formulas and other descriptions. This is an advantage not to be underestimated, especially with regard to students or freshmen in the field. After each chapter, the references are given. Except for historical citations, all references reflect the latest state-of-the-art, which is not always common for textbooks.

Throughout the whole book, the reader can recognize that Jahns and Helfert are very experienced university professors not only with respect to the scientific quality of their research but especially with regard to the didactic approach of this textbook.

Compared with other textbooks, such as *Fundamentals of Microoptics* by Zappe (2010, Cambridge University Press) or *Principles of Nanophotonics* by Novotny et al. (2012, 2nd edition, Cambridge University Press), *Introduction to Micro- and Nanooptics* definitively can assert itself, especially regarding technological implementation and industrial applicability.

In my opinion, on the level of a textbook, it is an almost perfect synopsis of Goodmann's classic *Fourier Optics* textbook and Jahn's earlier books such as *Microoptics* together with Sinzinger and the monograph *Microoptics: From Technology to Applications* together with Brenner.

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