

## Preface

This book serves two purposes: The first is to introduce the readers to some traditional topics such as the matrix formalism of geometrical optics, wave propagation and diffraction, and some fundamental background on Fourier optics. The second is to introduce the essentials of acousto-optics and electro-optics, and to provide the students with experience in modeling the theory and applications using MATLAB®, a commonly used software tool. This book is based on the authors' own in-class lectures as well as research in the area.

The key features of the book are as follows. Treatment of each topic begins from the first principles. For example, geometrical optics starts from Fermat's principle, while acousto-optics and electro-optics start from Maxwell equations. MATLAB examples are presented throughout the book, including programs for such important topics as diffraction of Gaussian beams, split-step beam propagation method for beam propagation in inhomogeneous as well as Kerr media, and numerical calculation of up to 10-coupled differential equations in acousto-optics. Finally, we cover acousto-optics with emphasis on modern applications such as spatial filtering and heterodyning.

The book can be used for a general text book for Optics/Optical Engineering classes as well as acousto-optics and electro-optics classes for advanced students. It is our hope that this book will stimulate the readers' general interest in optics as well as provide them with an essential background in acousto-optics and electro-optics. The book is geared towards a senior/first-year graduate level audience in engineering and physics. This is suitable for a two-semester course. The book may also be useful for scientists and engineers who wish to learn about the

basics of beam propagation in inhomogeneous media, acousto-optics and electro-optics.

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