

Contemporary Optics

With the advent of lasers, numerous applications of it such as optical information processing, holography, and optical communication have evolved. These applications have made the study of optics essential for scientists and engineers. The present volume, intended for senior under graduate and first-year graduate students, introduces basic concepts necessary for an understanding of many of these applications. The book has grown out of lectures given at the Master's level to students of applied optics at the Indian Institute of Technology, New Delhi. Chapters 1-3 deal with geometrical optics, where we develop the theory behind the tracing of rays and calculation of aberrations. The formulas for aberrations are derived from first principles. We use the method involving Luneburg's treatment starting from Hamilton's equations since we believe that this method is easy to understand. Chapters 4--8 discuss the more important aspects of contemporary physical optics, namely, diffraction, coherence, Fourier optics, and holography. The basis for discussion is the scalar wave equation. A number of applications of spatial frequency filtering and holography are also discussed. With the availability of high-power laser beams, a large number of nonlinear optical phenomena have been studied. Of the various nonlinear phenomena, the self-focusing (or defocusing) of light beams due to the nonlinear dependence of the dielectric constant on intensity has received considerable attention. In Chapter 9 we discuss in detail the steady-state self-focusing of light beams.

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