

PART I

FUNDAMENTALS OF LIGHT

Part I, which provides a brief introduction to optical physics, is the minimum prerequisite to an understanding of optical devices. Optical physics examines the nature of light, its propagation characteristics in vacuum and through matter, and its interaction with matter.

For example, interferometry must be understood before the Mach–Zehnder or Fabry–Perot interferometers are explained. Refraction and diffraction must be understood before Bragg gratings and filters are explained. Similarly, the nonlinear properties of matter must be understood before nonlinear fiber transmission phenomena are explained.

For simplicity, we have avoided complex mathematical derivations and have listed the minimum possible number of formulas needed to explain the operation of certain optical devices. The interested reader may consult advanced and specialized textbooks as well as other publications that provide full mathematical derivations. Our purpose is to provide a broad, yet thorough understanding of the workings of optical devices that are used in optical communications and in dense wavelength division multiplexing (DWDM) in Part II.

This part consists of two chapters. Chapter 1 describes the nature of light and its propagation characteristics. Chapter 2 provides a description of the interaction of light with matter.