

Table of Contents

1. **Introduction to Optical Fibers**
 - History of optical communications
 - Advantages of optical fiber technology
 - Applications of fiber optics
2. **Fundamentals of Optics**
 - Nature of light
 - Reflection and refraction
 - Snell's law
 - Total internal reflection
 - Numerical aperture
3. **Light Propagation in Optical Fibers**
 - Step-index fibers
 - Graded-index fibers
 - Ray theory
 - Wave theory
 - Single-mode and multimode fibers
4. **Transmission Characteristics**
 - Optical attenuation
 - Absorption and scattering losses
 - Bending losses
 - Dispersion mechanisms
 - Bandwidth limitations
5. **Optical Sources**
 - Light Emitting Diodes (LEDs)
 - Semiconductor lasers
 - Source characteristics
 - Modulation techniques
6. **Optical Detectors**
 - PIN photodiodes
 - Avalanche photodiodes (APDs)
 - Detector performance
 - Noise and sensitivity
7. **Fiber Optic Communication Systems**
 - System architecture
 - Power budget analysis
 - Rise-time budget
 - Digital transmission
 - Analog transmission
8. **Passive Optical Components**
 - Connectors
 - Splices
 - Couplers
 - Splitters
 - Optical filters
9. **Advanced Fiber Optic Technologies**
 - Wavelength Division Multiplexing (WDM)
 - Optical amplifiers (EDFA)
 - Specialty optical fibers

- Optical networking

10. Applications of Fiber Optics

- Telecommunications
- Internet and broadband
- Fiber-optic sensors
- Medical applications
- Industrial applications
- Military and aerospace systems