Basic Optical Communications Systems

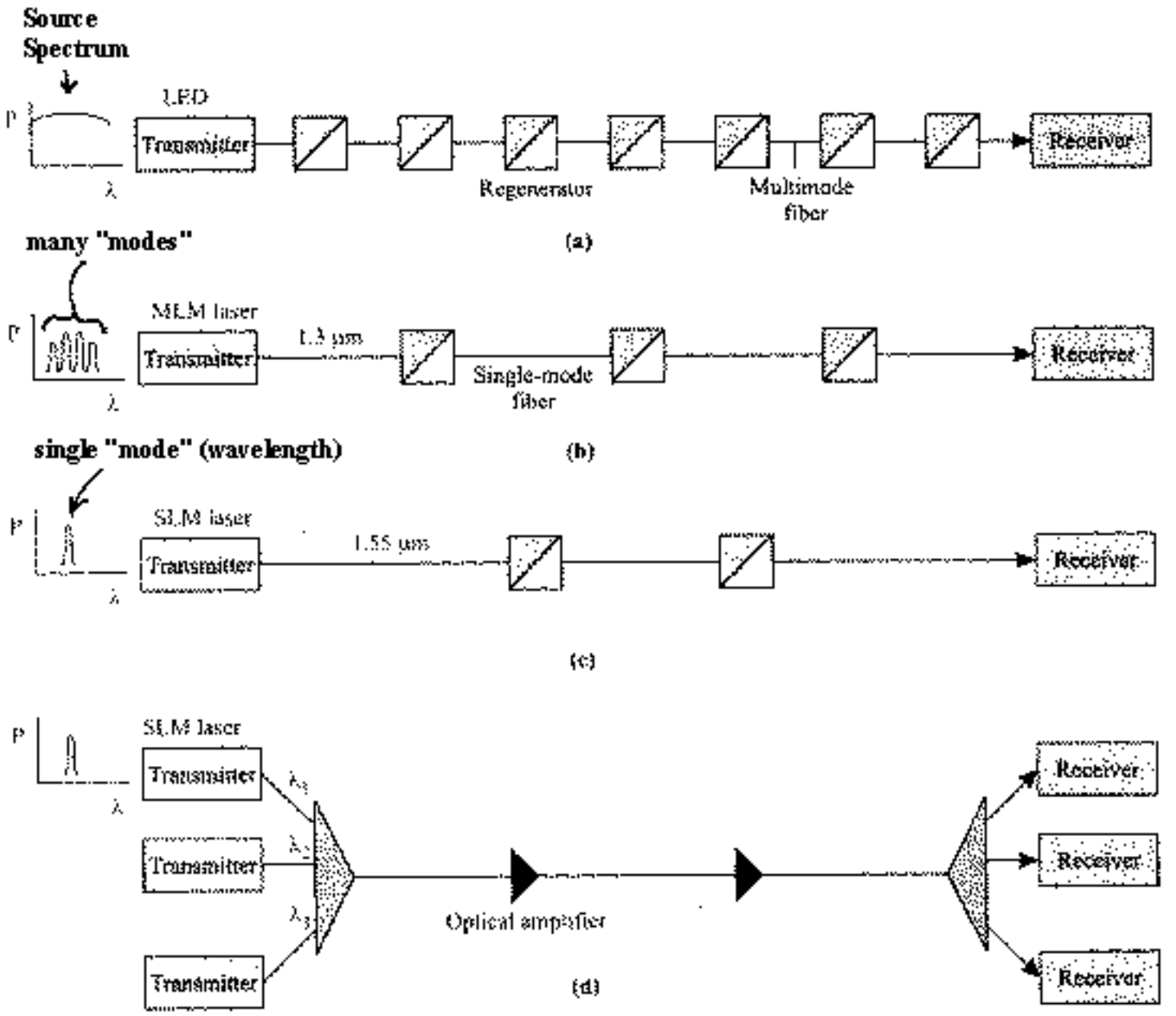
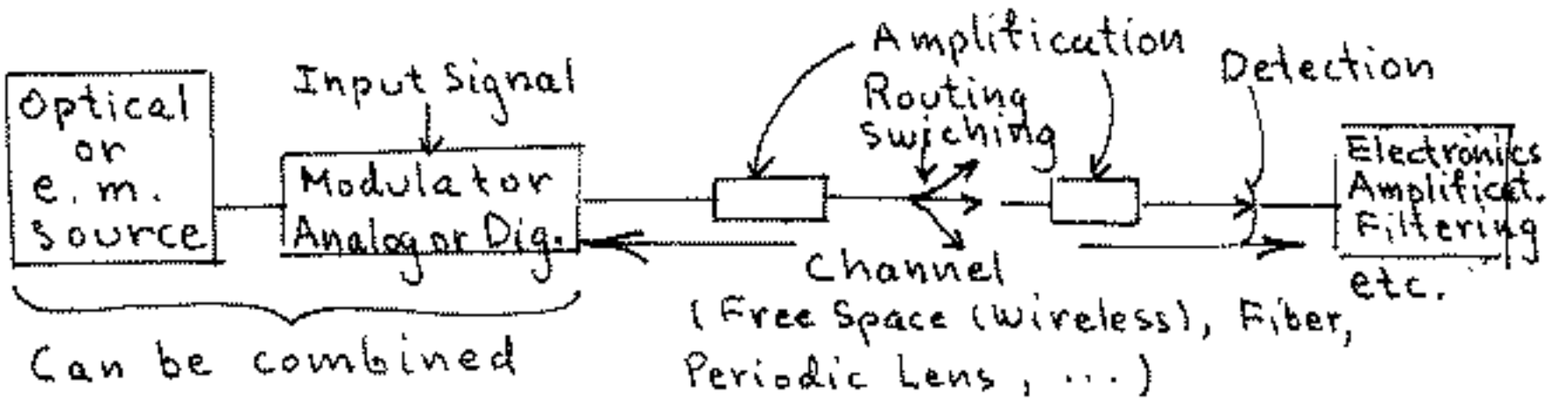


Figure 1.9 Evolution of optical fiber transmission systems. (a) An early system using LEDs over multimode fiber. (b) A system using MLM lasers over single-mode fiber in the 1.3 μm band to overcome modal dispersion in multimode fiber. (c) A later system using the 1.55 μm band for lower loss, and using SLM lasers to overcome chromatic dispersion limits. (d) A current-generation WDM system using multiple wavelengths at 1.55 μm and optical amplifiers instead of regenerators.

Basic Communication Link



EE118 - Introduction: Waves, Detection, Sources
Basic Semiconductor Laser and Detector Principle

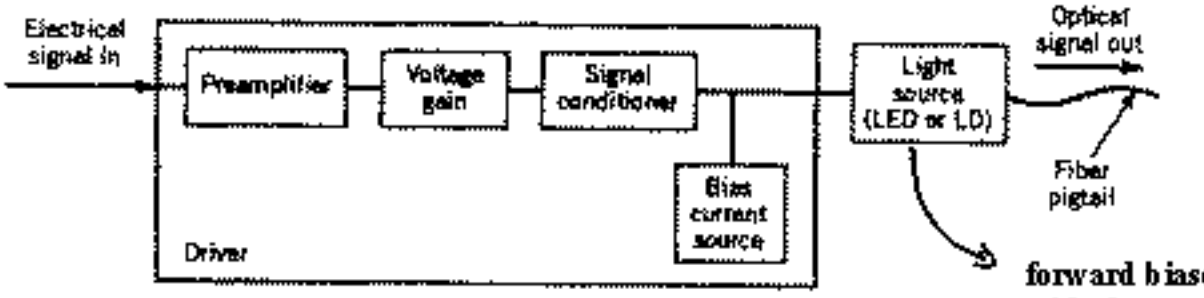
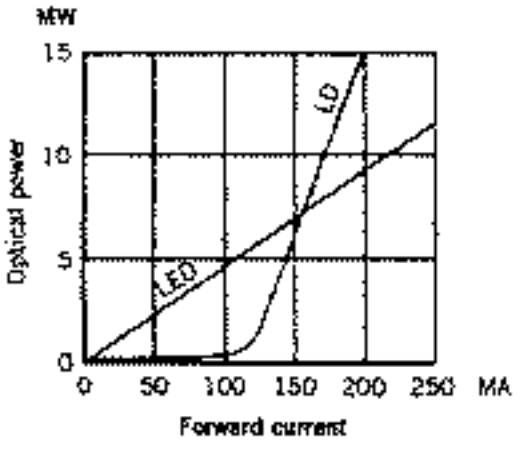
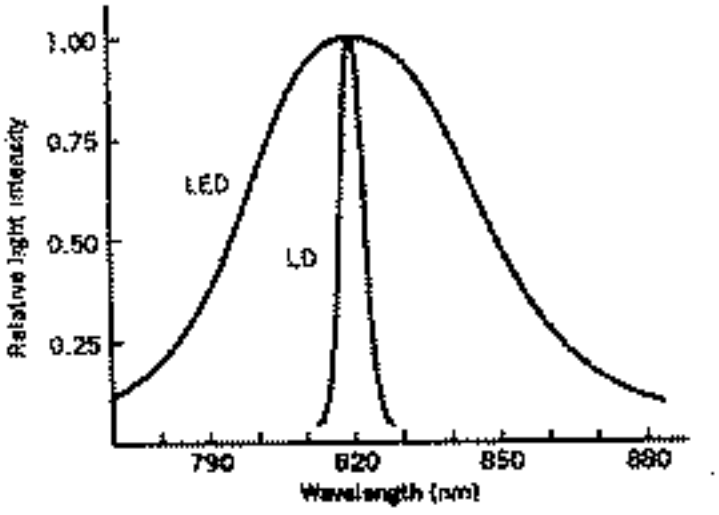


Figure 10.10. Block diagram of a typical fiber-optic transmitter.

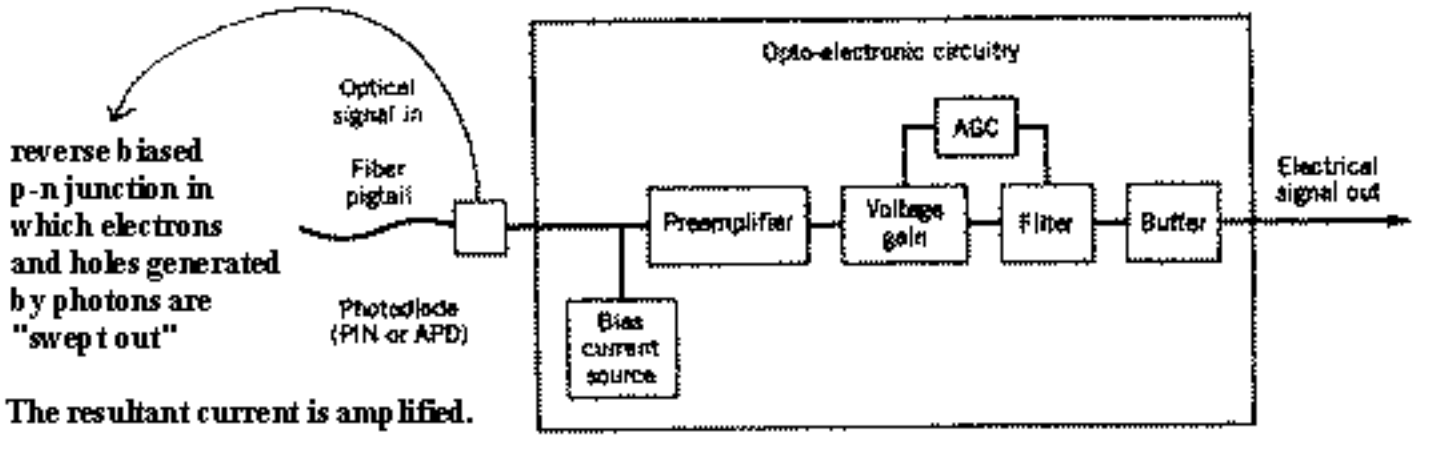
forward biased p-n junction with electrons and holes recombining in depletion region to give photons





Comparison of Typical LEDs and LDs

Characteristic	LED	LD
Coupled power* (μW) (max) (into 50-μm core)	>50	3000
Radiant power (mW) (max)	20	20
Spectral linewidth (nm)	30 to 150	<1 to 5
Wavelength (nm) (max)	1550	1550
Drive current (mA)	10 to 200	10 to 200
Modulation bandwidth (GHz) (max)	1	6
Life (hours) (estimated, not guaranteed)	10^5 to 10^6	10^4 to 10^5
Cost	Lower	Higher



The resultant current is amplified.

Simplified block diagram of a fiber-optic receiver.