



Assist.Prof. Dr. Muhanad Rasheed

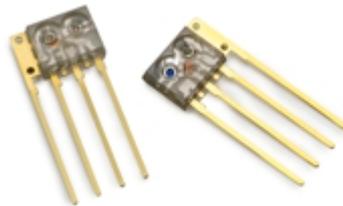
## Al-Rasheed University College

DEP. OF MEDICAL INSTRUMENTATION TECHNIQUES ENGINEERING

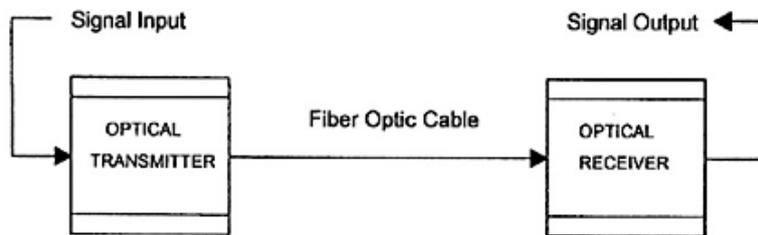
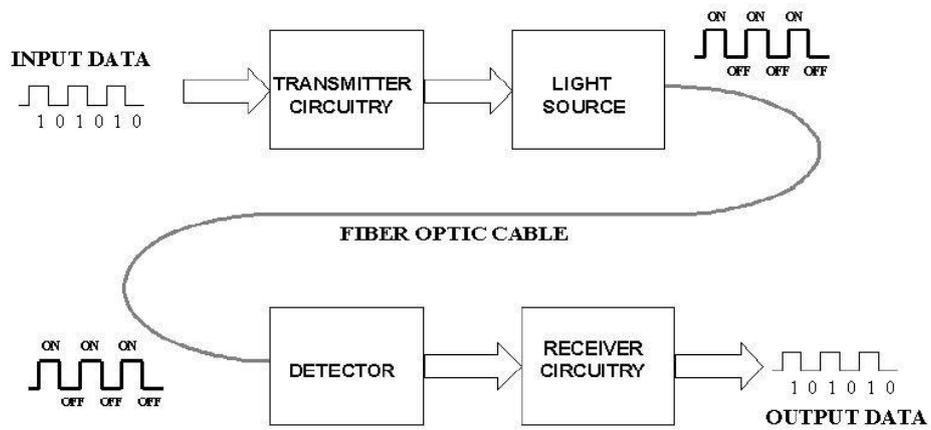
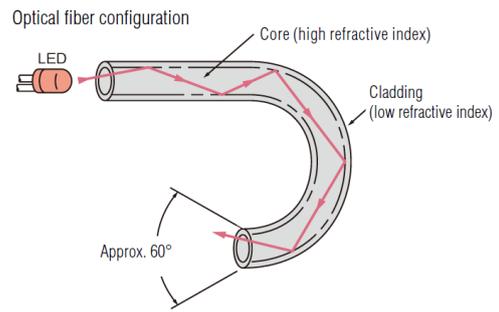
### Lecture 8:

#### **Transmitter device and circuits (communication LEDs)**

1. The most commonly used optical transmitters are **semiconductor devices such as light-emitting diodes (LEDs) and laser diodes.**
2. Fiber optic transmitters convert electrical signals into optical signals and then inject these optical signals into light-conducting cable. They use light emitting diodes (LED) or laser diodes as their optical source, and are designed for use with either single-mode or multi-mode fiber. They are available as chips or stand-alone units.



3. **Fiber optic transmitters consist of :**
  - a. **an interface circuit**, that receives electrical signals.
  - b. **a source drive circuit**, that converts them to optical signals at the optical source.
  - c. **an optical source**, that is the LED or laser diode which then sends the light signals to the fiber optic cable, where they travel to their destination.



4. The information transmitted is typically digital formation generated by computers.
5. LEDs are suitable for local-area-network applications with bit rates of **10–100 Mbit/s** and transmission distances of a few kilometers. This means that LEDs are **used mainly for short-to-moderate transmission distances because they have relatively large emitting areas**. They cost less than laser diodes, but have a limited bandwidth. Laser diodes can couple many times more power to optical fiber than LEDs.
6. **Laser diodes can couple many times more power to optical fiber than LEDs. Lasers are more expensive, but they are required for applications that must transmit signals over long distances.**

**See the comparison table below :**

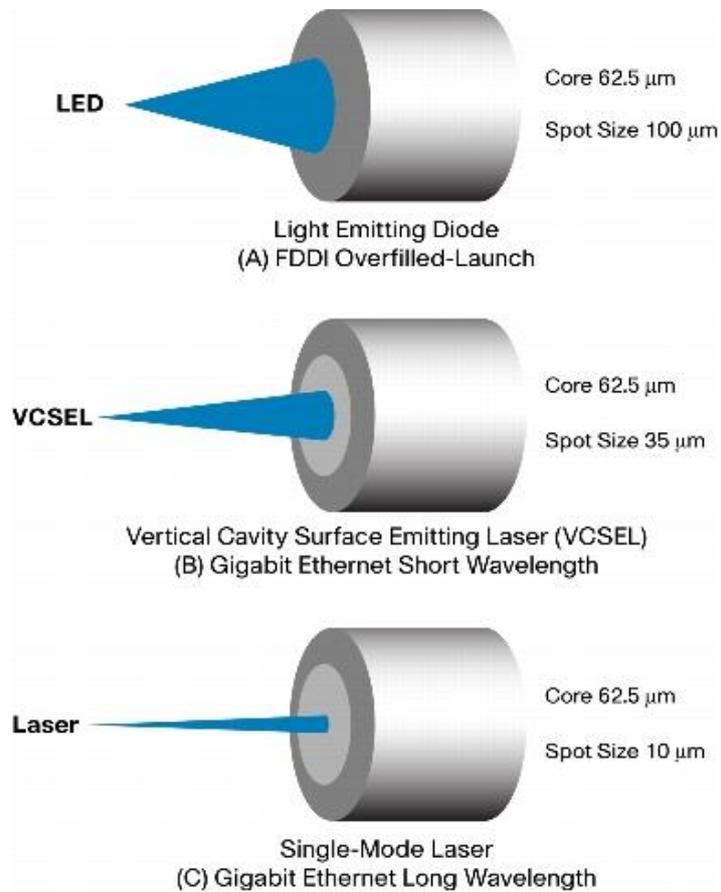
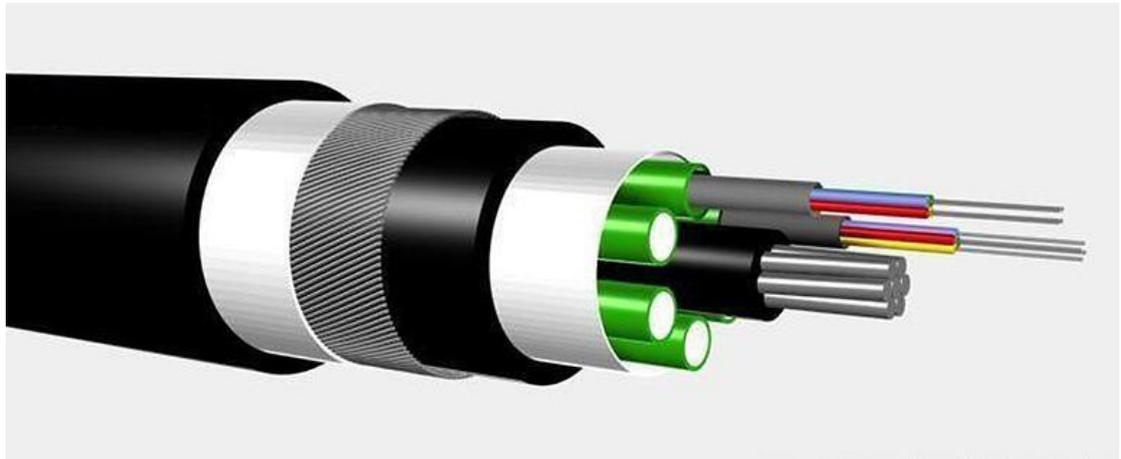
CHARACTERISTIC	LED	LASER DIODE
Cost	Low	High
Data rate	Low	High
Distance	Short	Long
Fibre type	Multimode fibre	Multimode and single mode fibre
Lifetime	High	Low
Temperature sensitivity	Minor	Significant

**7. Differences between single mode and multimode optical fibers :**

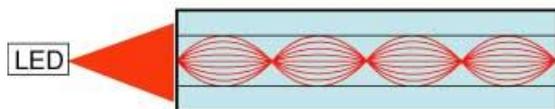
Single-mode fibers (SMF) have small cores and therefore are used with **laser sources** for high speed, long-distance links. They transmit infrared (IR) laser light at wavelength from 1,300 to at least 550 nm.

Multimode fibers (MMF) have larger cores and are used mainly **with LED sources** for lower speed, shorter distance links. The

typical transmission speeds and distance limits are 100 Mbit/s for approximately 2km, 1Gbit/s to 220-550m, and 10Gbit/s to 300m.



Overfilled Launch



Restricted Modal Launch

