CONSTRUCTION OF OPTICAL FIBER

❖ Optical Fiber:

- ❖ An optical fiber is a very thin, flexible transparent fiber made with plastic or glass.
- ❖ It has a cylindrical shape consisting of 5-layers or sections.

❖ Layers/sections:

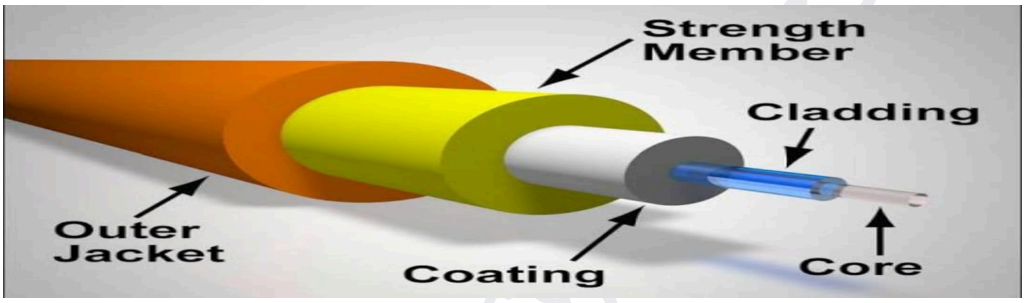
1.The core

2.The cladding

3.The Coating

4.The Strength member

5.The outer jacket or Buffer jacket or sheath.



❖ 1.The core:

- ❖ It is the central layer surrounded by another layer called cladding.
- ❖ Light is transmitted within the core, which has Refractive Index R.I (n_1).
- ❖ It is a denser medium, made up of glass(silica -SiO_2) or plastic with a high refractive index.
- ❖ This layered construction is essential for the effective and reliable transmission of data via light signals in telecommunication and networking applications.
- ❖ The diameter of core is 50 μm (approximately).

❖ 2.The cladding

- ❖ It is a second layer, surrounded by a third layer called the Coating.
- ❖ It has Refractive Index(RI) n_2, which is less than the Refractive Index(RI) of core ($n_1 > n_2$) and acts as a rarer medium.
- ❖ Has a lower refractive index than the core to keep light signals confined within the core by total internal reflection.
- ❖ To lower the RI of cladding, the silica is doped with phosphorus or bismuth materials.
- ❖ It has the diameter of 100μm (approximately).

- **The cladding performs the following important functions**:

  (i) Keeps the size of the fiber constant and reduces loss of light from the core into the surrounding air.

  (ii) Protects the fibers from physical damage and absorbing surface contaminants.

  (iii) Prevents leakage of light energy from the core (through frustrated TIR)

  (iv) Reduce the cone of acceptance and increase the rate of transmission of data.

  (v) It allows adding other protective layers over the fiber.

- **3.The Coating:**
- It is the third layer that protects the fiber from physical damage and microbending losses.
- It is usually made of a soft polymer to cushion the fiber.
- **4.The Strength member:**
- It is a fourth layer that provides tensile strength to the cable and prevents stretching during installation.
- It is often made of materials like aramid yarn (e.g., Kevlar).
- **5.The outer jacket or Buffer jacket or sheath:**
- It is the fifth (outermost) layer, which shields the internal components from environmental damage, abrasion(friction), and moisture.
- To provide necessary toughness & tensile strength, a layer of strength members is arranged surrounding the buffers jacket, made of polyurethane & diameter of 125 μm (approximately).
- Because of this arrangement fiber cable will not be damaged during stretching, bending and hard pulling.

  NOTE: The major and important parts of the laser are core, cladding and outer jacket.