Transmission Media :-

It can be broadly classified into two types

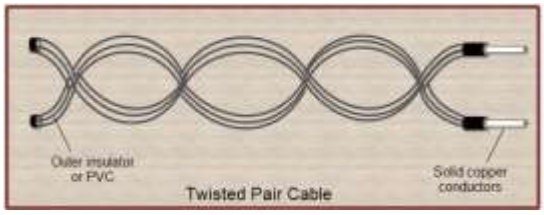
- **Guided Transmission Media:-** in this type of media , a physical path is established between source and destination. The signal or electrical impulse uses this path for transmission which is in the form of electromagnetic waves. Different types of guided Transmission Media are twisted pair, coaxial cable, optical fiber.

- **Unguided Transmission Media:-** in this type of media , there is no physical path between source and destination. this media is also known as wireless Transmission Media which does not guide the waves but provides a method or a way for transmitting them. Waves are propagated through air, vacuum, atmosphere. Different types of unguided Transmission Media are satellite microwave transmission, terrestrial microwave transmission, radio waves transmission and infrared waves.

Types of Guided Transmission Media:-

1- Twisted Pair Cable:-

Twisted Pair Cables are most commonly used guided transmission media. In twisted pair cable, two ordinary copper wires which acts as conductors are twisted around one another, so as to reduce the disturbance caused by electromagnetic waves or due to crosstalk between two adjacent circuits.



Usage of **Twisted Pair Cable:-**

1- Twisted Pair Cables are used both for analog and digital signals transmission.

2- They are generally used in homes and business computers for connecting them to telephone exchange network.

3- Higher grade of twisted wire is used for horizontal wiring in LAN installation.

4- Twisted Pair Cables are used for supporting voice data that is transmitted using analog signals.

Twisted Pair Cables are less expensive than coaxial cable and fiber optics.

There are two types of twisted pair cables.

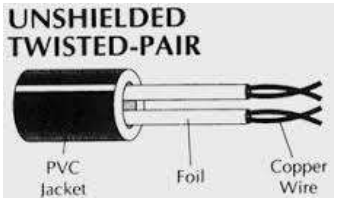
- **Unshielded Twisted Pair (UTP)Cable :-** In UTP , there is no shielding around the twisted pair.UTP are generally used In telephone companies and for computer networking.

Advantages of UTP:-

- It is very easier to work.
- Installation procedure is easy.

Disadvantage of UTP:-

Due to lack of shield UTP is highly susceptible to the electromagnetic interference.



- **Shielded Twisted Pair (STP)Cable :-** In STP there is a tough protected shield over each pair of copper wire that is used to reduce the electromagnetic interference that occurs during transmission.

Advantages of STP:-

Reduces the external interferences.

Disadvantages of STP:-

- Harder to work.
- Expensive when compared to UTP.
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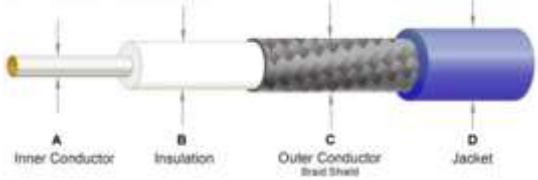
2- Coaxial Cable:-

It is most preferred guided transmission media for transmitting signals. It comprises of two conductors.

- Inner conductor which is surrounded by dielectric system.
- Outer conductor which surrounds the dielectric system.

Outer conductor is covered by protective shield called jacket.



Types of Coaxial Cable:-

1- Flexible coaxial cable.
2- Rigid coaxial cable.

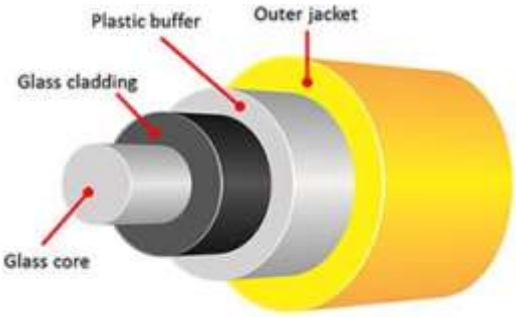
Flexible coaxial cable is most widely used coaxial cable.

Usage of Coaxial Cable:-

- Coaxial cables can be used for both long and short distance transmissions. In longer distance it used for connecting television and radio networks.
- Coaxial cables are used in telephone companies.
- They are used in business, installing Ethernet and other type of LAN.

3- **Fiber Optic Cable :-**

Fiber optics are constructed using plastic or glass fiber which transmit the data through light. It consists of three layers , the first layer is a thin strands of glass called core. The second layer that cover the core is a concentric layer called the cladding. The third layer acts as a protective sheath around cladding called jacket which is made of either glass or plastic.



Usage of Fiber Optics:-

- Because of the flexibility. optical fiber is used in telecommunication networking as well as fiber optics communication.
- Fiber optics are preferred while transmitting data over long distance due to its less susceptibility to attenuation and it requires very few repeaters .
- They are used in applications such as illumination, imaginary and for decorative purposes.

Bandwidth

Mathematically it can be shown that any complex waveform is a made of sine
Wave forms of different amplitudes and frequencies with varying phase relationships
Amongst each other. Look up bandwidth in Wiktionary, the free dictionary.

Bandwidth (signal processing) or analog bandwidth, frequency bandwidth or radio bandwidth: a measure of the width of a range of frequencies, measured in hertz

Bandwidth (computing), the rate of data transfer, bit rate or throughput, measured in bits per second (bit/s)

Noise

In any type of communication, noise is the biggest impairment. The received signal at the receiver end will consist of transmitted message plus additional unwanted signal that are inserted somewhere between transmitter and receiver distorting the message.
There are several types of noise sources, which can abruptly affect the quality of reception signal. The following are some of them

- **Thermal noise:** Due to thermal agitation of electrons. Present in all electronic devices and is the function of temperature.

- **Impulse noise:** Due to electromagnetic interference (EMI). They may be present in power lines, or in nature (lightning.. etc)

- **Delay distortion:** Due to non-uniform velocities of signals of different frequencies traveling in a guided media. Various frequencies of a message signal will arrive at different delays resulting in distortion.

Channel capacity

The maximum rate at which data can be transmitted over a communication channel under given conditions is referred as the channel capacity.
There are four parameters involved in the evaluation of channel capacity.

- **Data rate:** The rate at which data can be transmitted. Measured in bits per second
- **Bandwidth:** The bandwidth of the transmitted signal. Measured in cycles per second (Hz).
- **Noise:** The average level of unwanted signals over communication path. Expressed as the ratio between signal and noise.
- **Error rate:** The rate at which error can occur.

Then the channel capacity (in cycles per second) according to **Shannon's** theorem is given by: $\mathbf{C = B \log_2 (1+SNR)}$ Where

- **C** in Cycles per second and this is error free capacity
- **B** is the bandwidth in Hertz.
- **SNR =** $10 \log_{10}$ (Signal power/Noise power)

Normally this theorem represents maximum channel capacity. Actual values may be much less than as given by the formula. One reason for this is the SNR ratio. The SNR ratio assumes only white noise (thermal noise) where as other noise like impulse noise, attenuation noise and delay noise are not taken into account.