

**ACADEMIC PROGRAMME: BACHELOR OF SCIENCE IN COMPUTER SCIENCE**

**COURSE CODE AND TITLE: BSCS 302 – DATA COMMUNICATION AND NETWORKS**

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### **TRANSMISSION MEDIA**

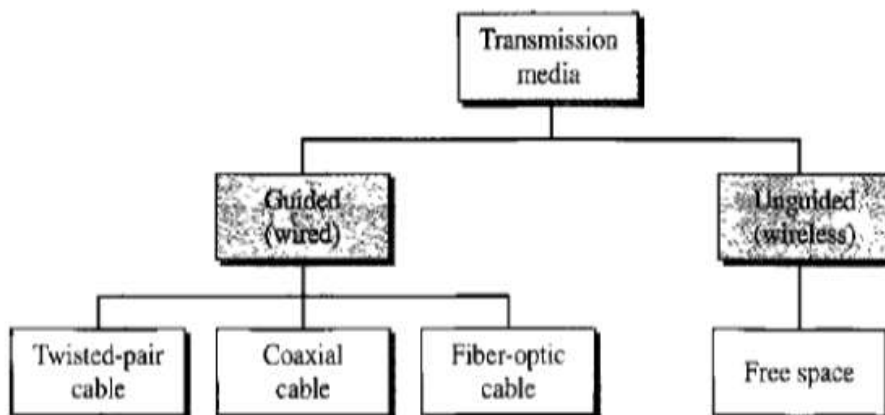
A transmission medium (transmission media) is a material substance which can propagate energy waves or in other words transmission media is a path/ means through which data transmission is made possible from one place to another.

Transmission medium can be broadly defined as anything that can carry information from a source to a destination.

Transmission media are the physical pathways that connect computers, other devices, and people on a network.

A transmission medium can be classified as:

- GUIDED MEDIA
- UNGUIDED MEDIA



#### **1. GUIDED MEDIA**

□ Guided media, which are those that provide a conduit from one device to another, include twisted-pair cable, coaxial cable, and fiber-optic cable.

□ A signal travelling along any of these media is directed and contained by the physical limits of the medium.

1. Twisted pair cable
2. Coaxial Cable.
3. Fiber optics

#### **TWISTED PAIR CABLE**

- Twisted pair cabling is made of pairs of solid or stranded copper twisted along each other.

- A twisted pair consists of two conductors (normally copper), each with its own plastic insulation, twisted together, One of the wires is used to carry signals to the receiver, and the other is used only as a ground reference.
- It is light weight, easy to install, inexpensive and support many different types of network.
- It also supports the speed of 100 mps.

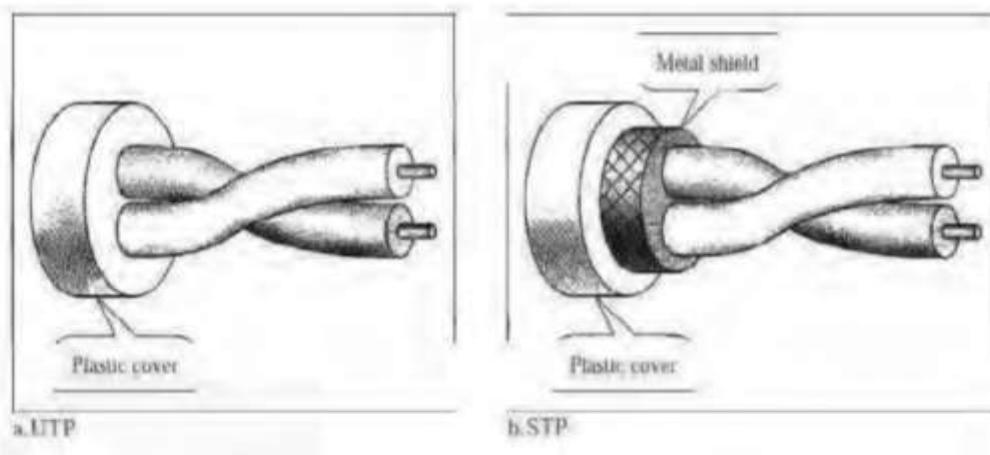


**Fig.: Twisted pair wire**

- Twisting makes it probable that both wires are equally affected by external influences (noise or crosstalk).
- By twisting the pairs, a balance is maintained.

#### **UNSHIELDED(UTP) VERSUS SHIELDED TWISTED-PAIR(STP) CABLE**

The most common twisted-pair cable used in communications is unshielded twisted-pair (UTP). STP cable has a metal foil or braided mesh covering that encases each pair of insulated conductors. Although metal casing improves the quality of cable by preventing the penetration of noise or crosstalk, it is bulkier and more expensive, provide higher transmission rate. Figure below shows the difference between UTP and STP.

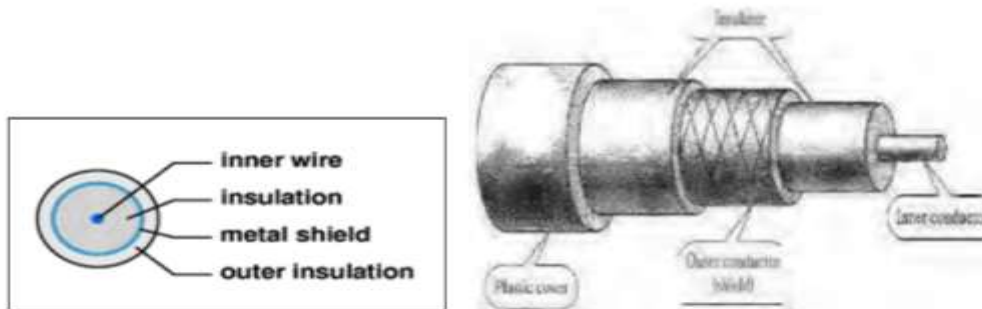


#### **Applications**

- ☐ Twisted-pair cables are used in telephone lines to provide voice and data channels.
- ☐ The DSL lines that are used by the telephone companies to provide high data-rate connections also use the high-bandwidth capability of unshielded twisted-pair cables.
- ☐ Local-area networks

## COAXIAL CABLE

Coaxial cable (or coax) carries signals of higher frequency ranges than those in twisted pair cable, because the two media are constructed quite differently. Coax has a central core conductor of solid or stranded wire (usually copper) enclosed in an insulating sheath, which is, in turn, encased in an outer conductor of metal foil, braid, or a combination of the two.



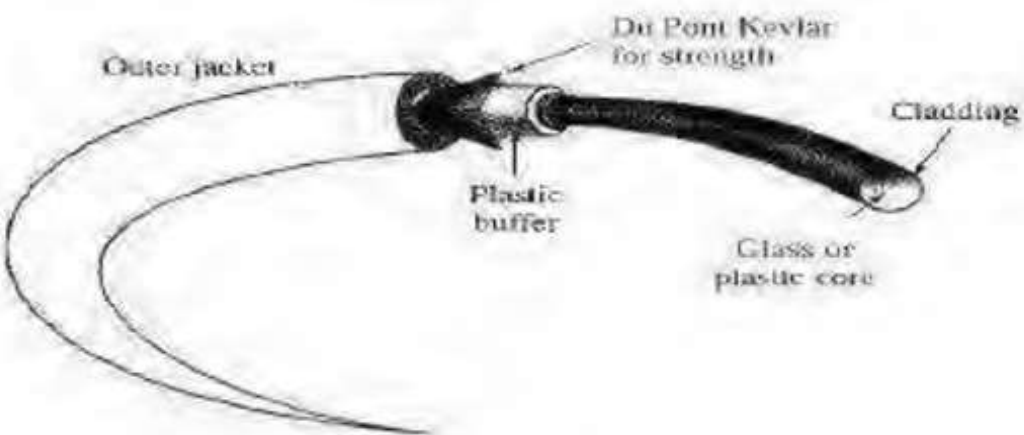
**Figure: Cross-section of a coaxial cable**

### Applications

- Coaxial cable was widely used in analog telephone networks.
- Cable TV networks also use coaxial cables.
- Hybrid networks use coaxial cable only at the network boundaries, near the consumer premises.
- Traditional Ethernet LANs

## FIBER OPTIC CABLE (FIBER OPTICS)

A fiber-optic cable is made of glass or plastic and transmits signals in the form of light. Optical fibers use reflection to guide light through a channel. A glass or plastic core is surrounded by a cladding of less dense glass or plastic.



### Applications

- Fiber-optic cable is often found in backbone networks because its wide bandwidth is cost-effective.
- Some cable TV companies use a combination of optical fiber and coaxial cable, thus creating a hybrid network.

## 2. UNGUIDED MEDIA

- Unguided transmission media are methods that allow the transmission of data without the use of physical means/path or conductor to transmit data.
- This type of communication is often referred as wireless communication where Signals are normally broadcast through free space.

Unguided signals can travel from the source to destination in several ways:

- ✚ ground propagation,
- ✚ sky propagation, and
- ✚ line-of-sight propagation.



- In ground propagation, radio waves travel through the lowest portion of the atmosphere.
- In sky propagation, higher-frequency radio waves radiate upward into the ionosphere where they(waves) are reflected back to earth.
- In line-of-sight propagation, very high-frequency signals are transmitted in straight lines directly from antenna to antenna.

Wireless transmission can be divided into some category as:

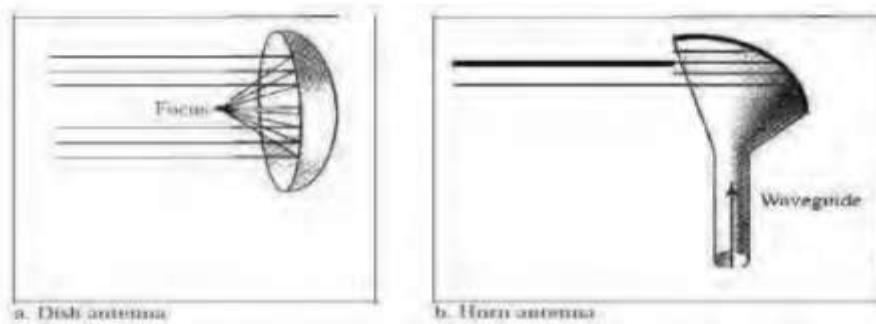
- microwave
- radio waves
- infrared waves

## MICROWAVES

- Electromagnetic waves having frequencies between 1 and 300 GHz are called microwaves.
- Microwaves are unidirectional.

- Because of unidirectional property, a pair of antennas can be aligned without interfering with another pair of aligned antennas.
- Microwave propagation is line-of-sight. To make mounted antennas to be in direct sight of each other towers that are far apart need to be very tall
- Two types of antennas are used for microwave communications: the **parabolic dish** and the **horn**.

### *Unidirectional Antenna*



#### **Applications**

- ☐ Microwaves, due to their unidirectional properties, are very useful in unicast (One-to-one) communication.
- ☐ They are used in cellular phones, satellite networks and wireless LANs.

### **RADIO WAVES**

- Electromagnetic waves ranging in frequencies between 3 kHz and 1 GHz or frequency below to visible light are called radio waves.
- Flow of signals is omnidirectional when an antenna transmits radio waves, they are propagated in all directions where the sending and receiving antennas do not have to be aligned.

#### **Applications**

The omnidirectional characteristics of radio waves make its useful for multicasting, Where AM and FM radio, television, maritime radio, cordless phones, and paging are examples of multicasting.

### **INFRARED**

- ☐ Infrared waves are used for short-range communication.
- ☐ Infrared waves, having high frequencies, cannot penetrate walls.
- ☐ A short-range communication system in one room cannot be affected by another system in the next room.

#### **Applications**

- ☐ Infrared waves signals can be used for communication between devices such as keyboards, mice, PCs, TVs and printers.