



# Subject: Digital Communications

Class: 3<sup>rd</sup>

## Lecture One

### "Introduction to Digital Communications"

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## Lecture Outlines

### ☒ Introduction of digital communication.

- ❖ Main diagram of digital communication system
- ❖ Types of communication systems
- ❖ Advantages of digital communication
- ❖ Disadvantages of digital communication
- ❖ Main types of communication systems

### Teaching Tools:

- White Board, white board marker and eraser

### Teaching Methods:

1. Method of lecture.
2. Method of discussion and dialogue.
3. Brain storming

### ❖ Introduction to digital communications:

The term digital communication covers a broad area of communications techniques, including digital transmission and digital radio.

Digital transmission, is the transmitted of digital pulses between two or more points in a communication system. Digital radio, is the transmitted of digital modulated analog carriers between two or more points in a communication system.

❖ The main diagram of digital communication system is shown below:

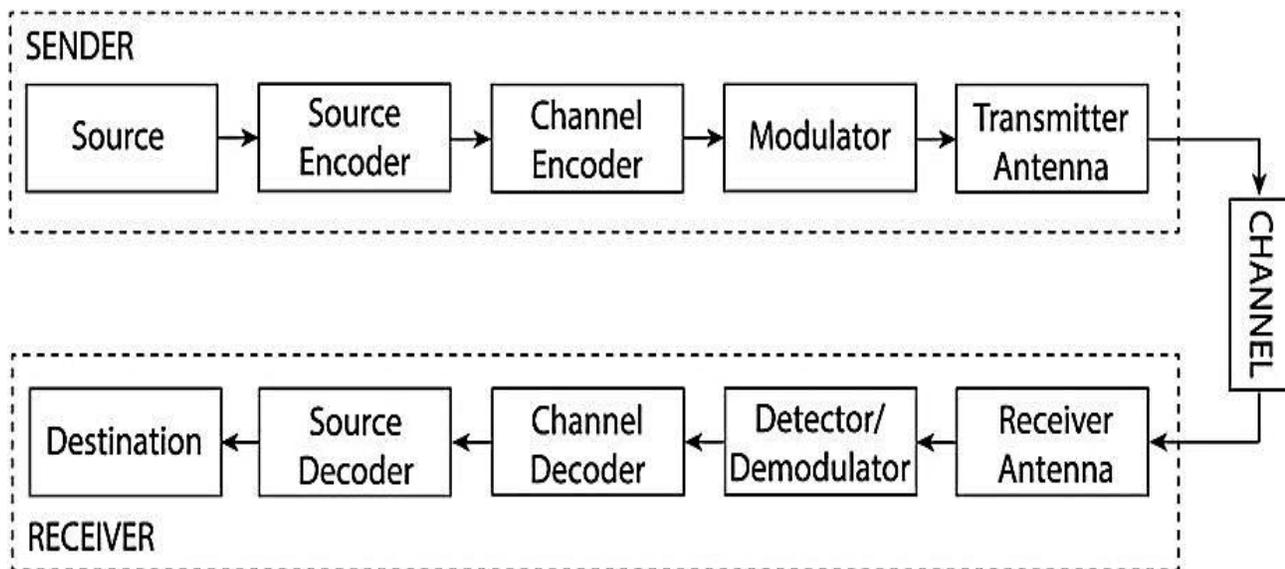


Figure (1): Main diagram of digital communication system

Where:



**Source:** analog or digital

**Channel:** cable, optical fibre, free space, etc.

**Destination:** person, loud, speaker, computer, etc.

**Types of information:** Voice, data, video, music, email, etc.

### ❖ **Advantages of digital communications:**

There are many reasons for choosing digital communications as the best transmission systems to be used in the recent communication applications.

- A. The primary advantage is the ease with which digital signals, compared to analog signal, are regenerative.

The shape of the waveform is affected by two mechanisms:

- (1) As all the transmission lines and circuits have some nonideal transfer function, there is a distorting effect on the ideal pulse.
- (2) Unwanted electrical noise or other interference further distorts the pulse waveform.

Both of these mechanisms cause the pulse shape to degrade as a function of distance. During the time that the transmitted pulse can still be reliably identified, the pulse is thus regenerated. The circuits that perform this function at regular intervals along a transmission system are called regenerative repeaters.



- B.** Digital circuits are less subject to distortion and interference than analog circuits.
- C.** Digital circuits are more reliable and can be produced at lower cost than analog circuits. Also, digital hardware lends itself to more flexible implementation than analog hardware.
- D.** Digital techniques lend themselves naturally to signal processing functions that protect against interference and jamming.
- E.** Much data communication is computer to computer, or digital instrument or terminal to computer. Such digital terminations are naturally best served by digital link.

#### ❖ **Disadvantages of digital communications:**

- A.** Requires reliable synchronization.
- B.** Requires A/D conversion at high rate.
- C.** In general, requires larger bandwidth than analog systems.

#### ❖ **Main types of communication systems:**

- ✓ Public Switched Telephone Network (voice, fax, modem)
- ✓ Satellite systems
- ✓ Radio, TV broadcasting, and Cellular phones
- ✓ Computer networks (LANs, WANs, WLANs)



## Summary

1. In this lecture the principle and techniques of digital communications had been introduced.
2. The main types of multiplexers had been presented.
3. The digital communications will be considered as the best transmission technique as compared with analog systems

## Homework

- 1. What are the advantages and disadvantages of digital systems?**
- 2. Draw the main diagram of digital Communication System?**
- 3. What are the main types of communication systems?**

### ❖ **References:**

1. "Digital communications ", J.G .Proakis, 2001.
2. "Digital Communications Fundamentals ", B. Sklar, A. V. Oppenheim, and W. Ronald, 2008.