Al-Mustaqbal University

College of Engineering & Technology

Computer Engineering Department

Digital Communication

Lecture 1

Introduction to Digital Communication

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Aims of this Lecture

- To **provide** a comprehensive understanding of digital communication systems (DCS),
- To **define** advantages, disadvantages of DCS
- To know the key components of DCS.

Learning Outcomes of this Lecture

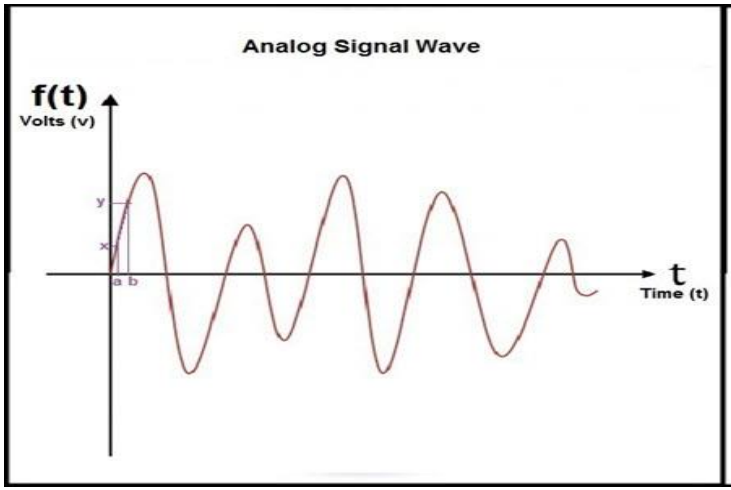
By the end of this lecture, students will be able to:

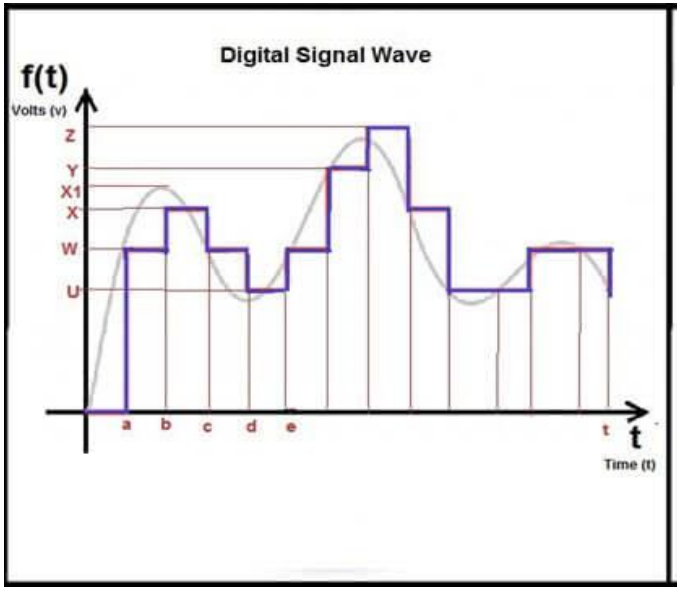
- ✓ **Explain** the advantages and disadvantages of digital communication systems.
- ✓ **Describe** the basic block diagram and the transformations in a digital communication system.

Introduction to Digital Communication

- Digital communication systems are becoming increasingly attractive because of the ever-growing demand for data communication.
- **Finite vs Infinite Waveforms:** Digital systems send waveforms from a finite set of possible waveforms, while analog systems use an infinite variety of waveforms.
- **Objective at the Receiver:** In a DCS, the objective at the receiver is not to reproduce a transmitted waveform with precision; instead, the objective is to determine from a noise-perturbed signal which waveform from the finite set of waveforms was sent by the transmitter.
- **Probability of Error (PE):** An important measure of system performance in digital communication.

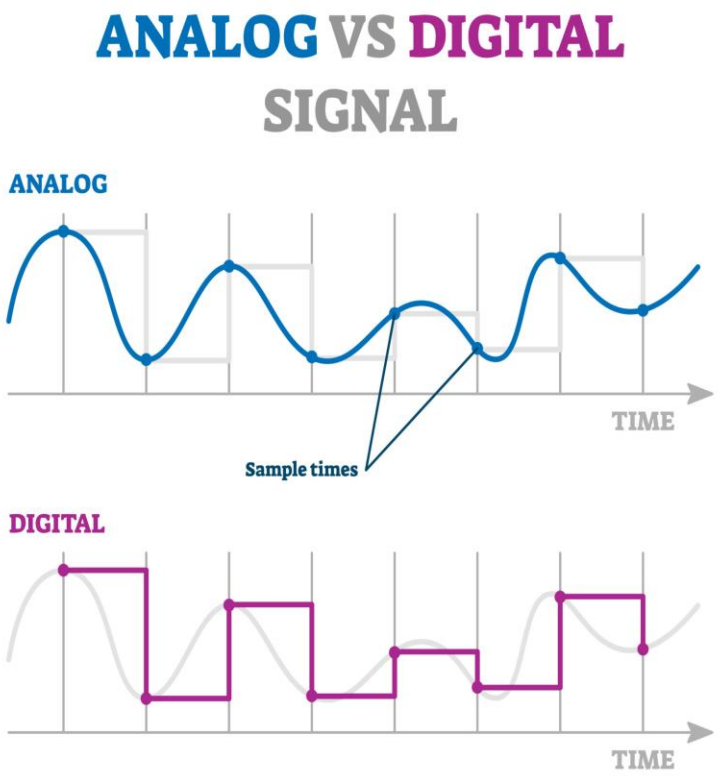
Introduction to Digital Communication





Advantages of Digital Communication

1. Ease of regenerating digital signals compared to analog signals.
2. Digital circuits are less subject to distortion and interference.
3. Security and low error rates through error detection and correction.
4. Digital hardware is more flexible and cost-effective.



Disadvantages of Digital Communication

1. **Greater Bandwidth Requirement:** Digital communications require more bandwidth than analogue to transmit the same information.
2. **Synchronization Requirement:** Digital systems need to be synchronized, which is not necessary in analogue systems.
3. **Sampling Noise:** Digital systems introduce noise from the sampling process.
4. **Sudden Degradation in Quality:** When the signal-to-noise ratio drops below a certain threshold, the service quality can shift abruptly from good to poor. Analog systems degrade more gracefully.

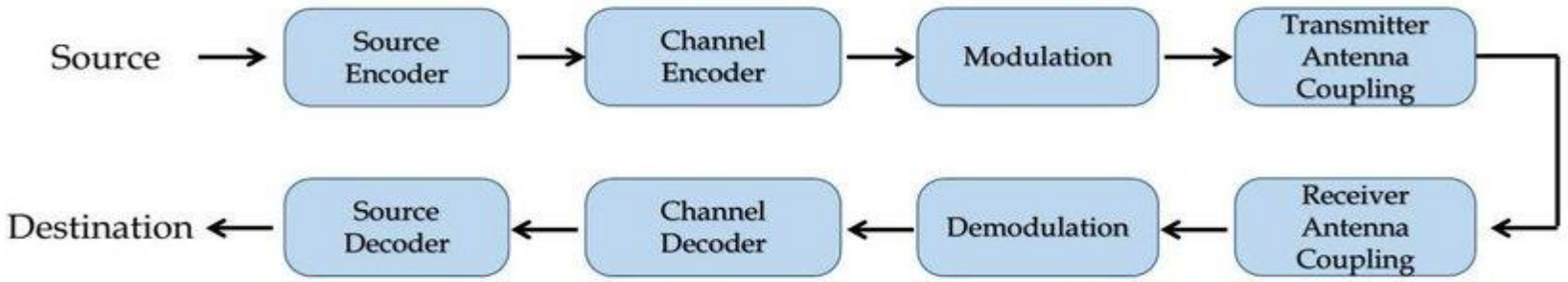
Class Activity 1

- **Break into groups to explain advantages and disadvantages of digital communication.**

Block diagram of a typical DCS

1. **The upper blocks** denote signal transformations from the source to the transmitter (XMT)
2. **The lower blocks** denote signal transformations from the receiver (RCV) to the sink, essentially reversing the signal processing steps performed by the upper blocks.

➢ The modulate and demodulate/detect blocks together are referred to as a **modem**.



Class Activity 2

- **Break into groups to explain each block of the diagram.**

Homework

- Apart from the **mentioned** con and cos, can you provide **additional** advantages and disadvantages of digital communication?

- Send this homework to Ahmed.Janabi@uomus.edu.iq

(Subject should be**: Your Name – Homework Week1**)

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AS
YOU ARE THE BEST