



Analog Communication Systems

EC-413-F



Lecture No 1

Topics To be Covered

- ❖ Basic concepts of Communication System
- ❖ Block Diagram description of Communication System

ANALOG COMMUNICATION SYSTEM

L T P Class work Marks: 50

3 1 - Theory Marks : 100

Total Marks : 150

Time duration : 3 Hrs

NOTE: For setting up the questions paper, Questions No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common questions, which is compulsory, and one questions from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section- A

Analog Modulation Techniques: Introduction, Theory of Amplitude Modulation; AM Power Calculations, AM Modulation with a Complex wave, Theory of Frequency Modulation (FM); Spectra of FM Signals, Narrow Band and Wide Band FM, Theory of Phase Modulation, Comparison of AM and FM, Comparison of PM and FM, Noise and Frequency Modulation, Pre-emphasis and De-emphasis.

Section-B

AM Transmission/AM Reception: Introduction, Generation of Amplitude Modulation, Basic Principles of AM Generation; Square law Diode Modulation, Vander Bijl Modulation, Suppressed Carrier AM Generation, Ring Modulator, Balanced Modulator. Tuned Radio Frequency (TRF) Receiver, Basic Elements of AM Super-heterodyne receiver; RF Amplifiers Characteristics-Sensitivity, Selectivity, Image Frequency Rejection, Mixers Tracking and Alignment, Local Oscillator, IF Amplifier, AM Detectors; Envelope or Diode Detector, AGC, AM Receiver using Transistors Communication Receiver.

Section-C

FM Transmission/FM Reception: Generation of FM by Direct Methods. Indirect Generation of FM; the Armstrong Method, FM Stereo Transmission.FM Receiver Direct Methods of Frequency Demodulation. Slope Detector, Travis Detector Foster Seely or Phase Discriminator, Indirect methods of FM Demodulation; FM Detector using PLL and Stereo FM Multiplex Reception.

Section-D

SSB Transmission/SSB Reception: Advantages of SSB transmission, Generation of SSB; Independent Side-Band Systems (ISB), Vestigial Side-Band Modulation (VSB).SSB Product Demodulator, Balanced Modulator as SSB Demodulator, ISB/Suppressed Carrier Receiver. Pulse Modulation Transmission and Reception: Introduction, Pulse Amplitude Modulation (PAM), PAM Modulator Circuit, Demodulation of PAM Signals, Pulse Time Modulation (PTM); Pulse Width Modulation (PWM), Pulse Position Modulation (PPM), PPM Demodulator. FSK, PSK.

REFERENCE BOOKS:

1. George Kennedy, "Electronic Communication System", 4th edition, McGraw- Hill (2000).
2. Gary M. Miller and Jeffery S. Beasley, "Modern Electronic Communications ", 7/e PHI.
3. Simon Haykin, "Communication Systems", 8th edition, Wiley Publishers.
4. Wayne Tomasi, "Electronics Communication systems", 4th Edition, Pearson Publishers.

Essentials of Communication System

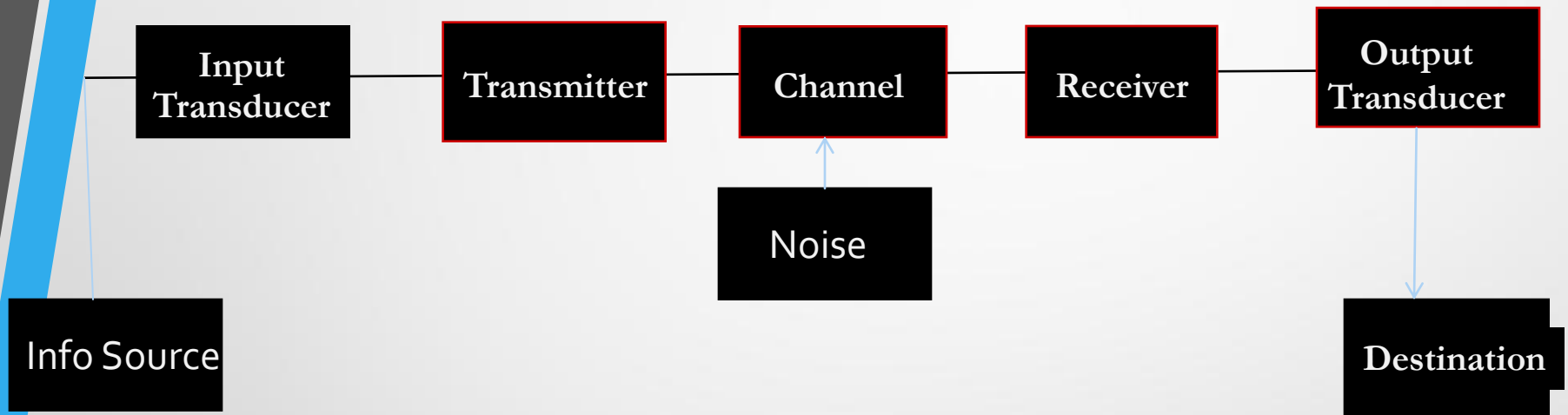


Figure: Block Diagram of Analog Communication System

Essentials of Communication System

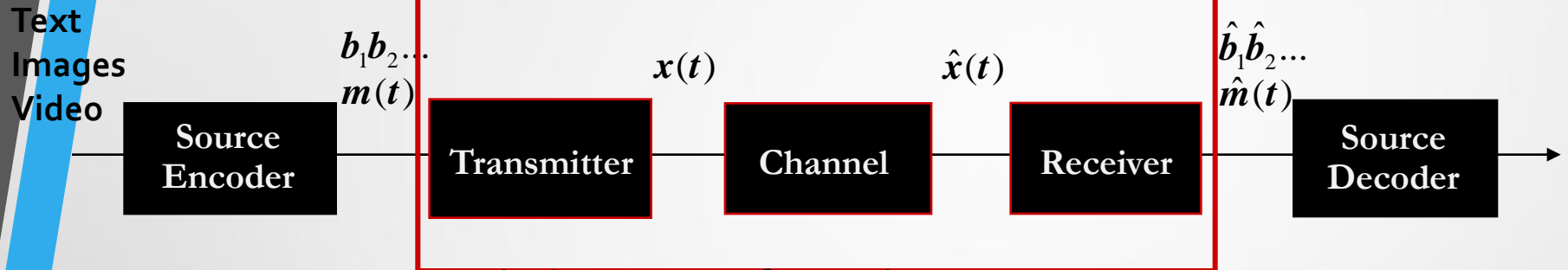
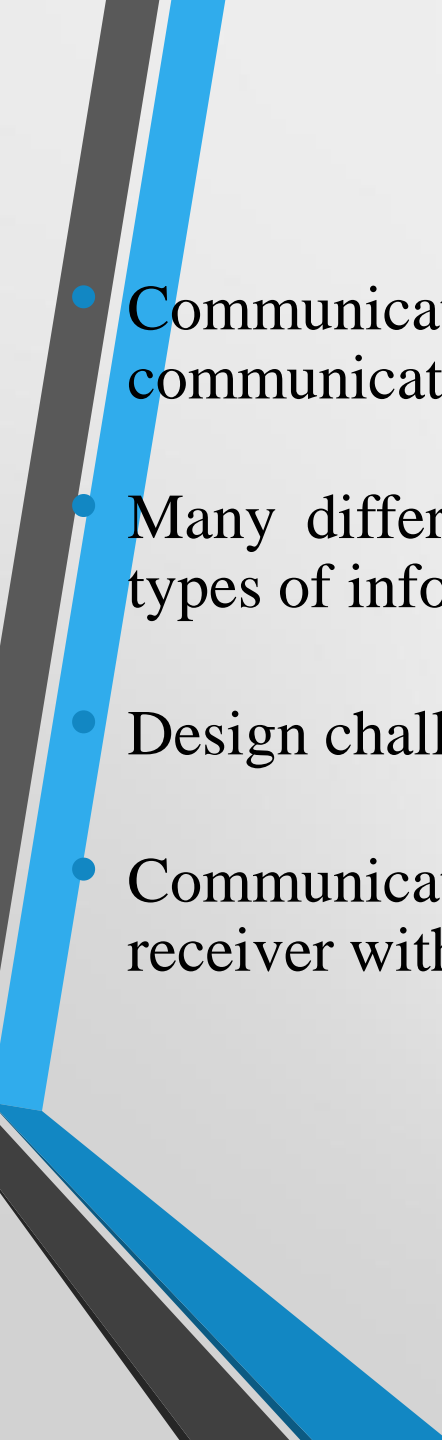
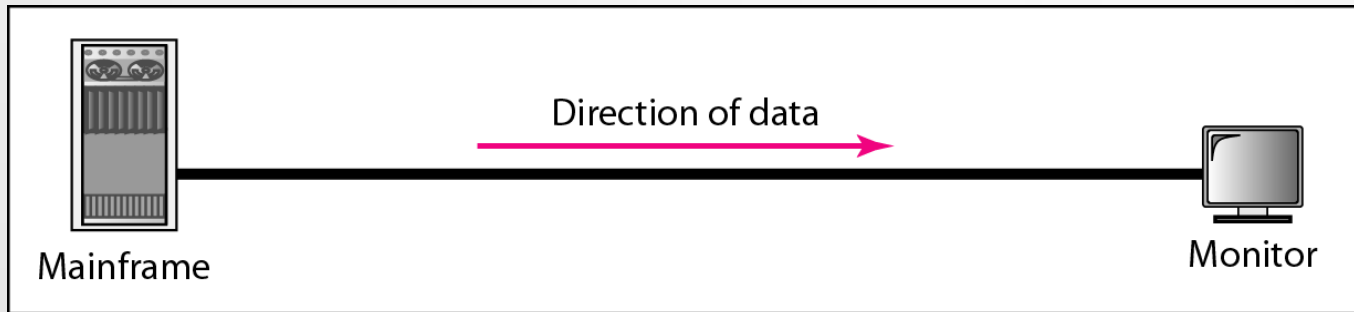


Figure: Block Diagram of Digital Communication System

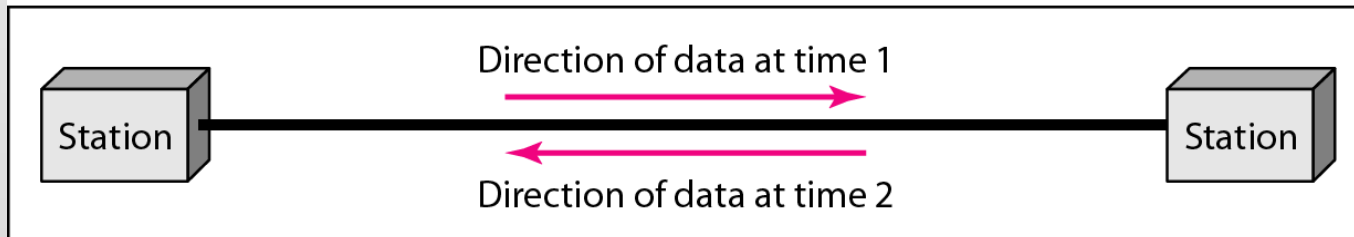
- Source encoder converts message into message signal or bits.
- Transmitter converts message signal or bits into format appropriate for channel transmission (analog/digital signal).
- Channel introduces distortion, noise, and interference.
- Receiver decodes received signal back to message signal.
- Source decoder decodes message signal back into original message.

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- Communication systems send information electronically over communication channels.
 - Many different types of systems which convey many different types of information.
 - Design challenges include hardware, system, and network issues.
 - Communication systems recreate transmitted information at receiver with high fidelity.

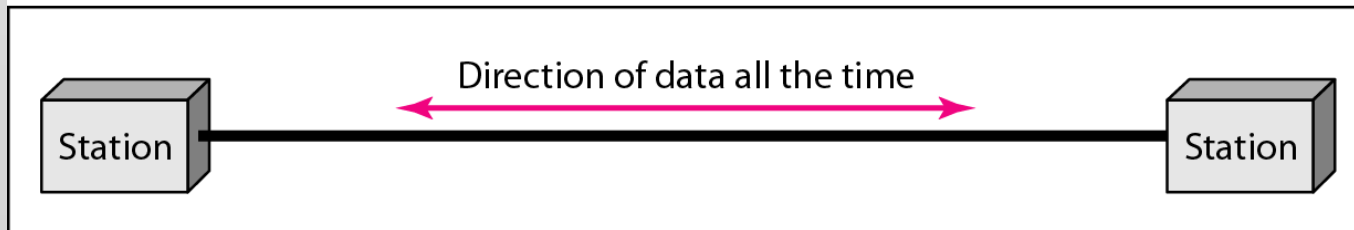
Modes of Communication: *Simplex, Half-Duplex and Full-Duplex*)



a. Simplex



b. Half-duplex



c. Full-duplex

- **Simplex (SX) – one direction only, e.g. TV**
- **Half Duplex (HDX) – both directions but not at the same time, e.g. CB radio**
- **Full Duplex (FDX) – transmit and receive simultaneously between two stations, e.g. standard telephone system**
- **Full/Full Duplex (F/FDX) - transmit and receive simultaneously but not necessarily just between two stations, e.g. data communications circuits**

Medias for Communication

- Telephone Channel
- Mobile Radio Channel
- Optical Fiber Cable
- Satellite Channel