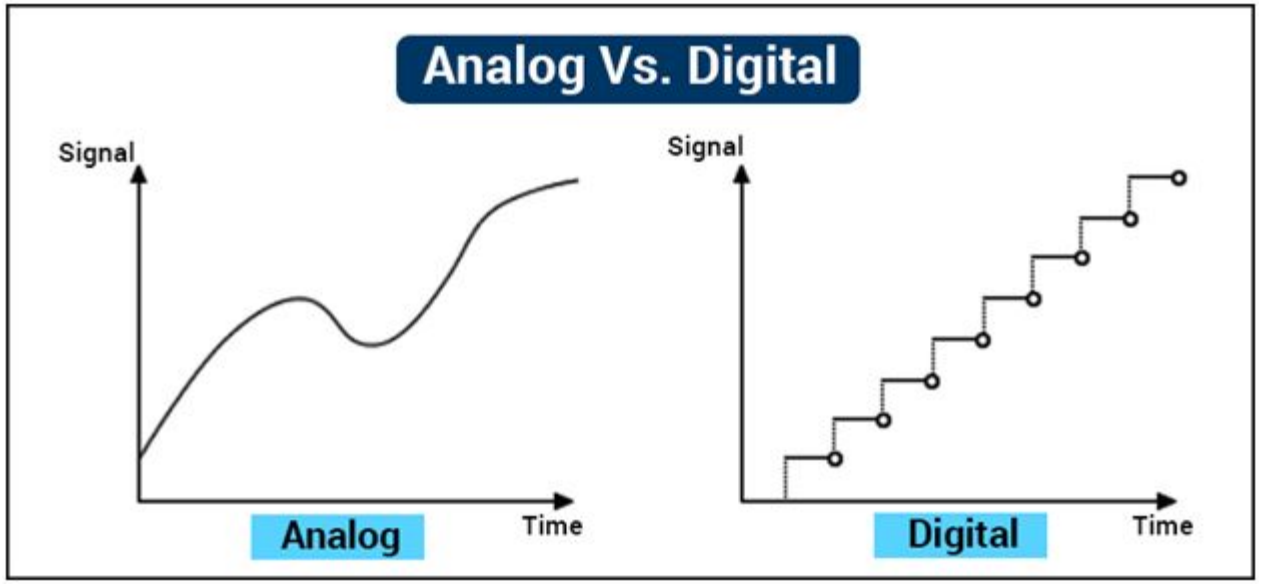
COMMUNICATION SYSTEMS

Definition: Sending, processing, and receiving of information bearing signal by electrical means.

Types : Analog and Digital



Text books:

1. B. P. Lathi, "Modern Digital and Analog Communication Systems".
2. Simon Haykin, "Analog and Digital Communication Systems".
3. George Kennedy and Bernard Davis, "Electronics & Communication System", TMH, 2004.

Example of Communication

- Mobile communication
- Satellite communication
- V-sat communication
- Micro-wave communication
- Optical fibre communication
- Internet communication
- Radar communication

Major way of communication

- Telephone
- Television
- Radio
- Internet

Block Diagram of Analog Communication System

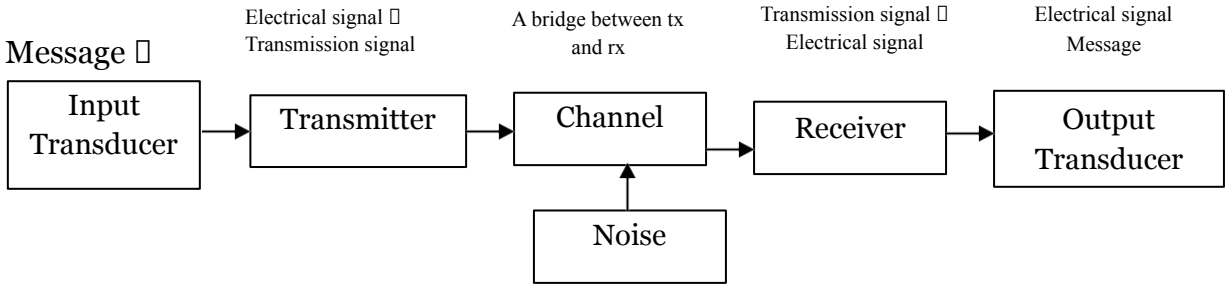


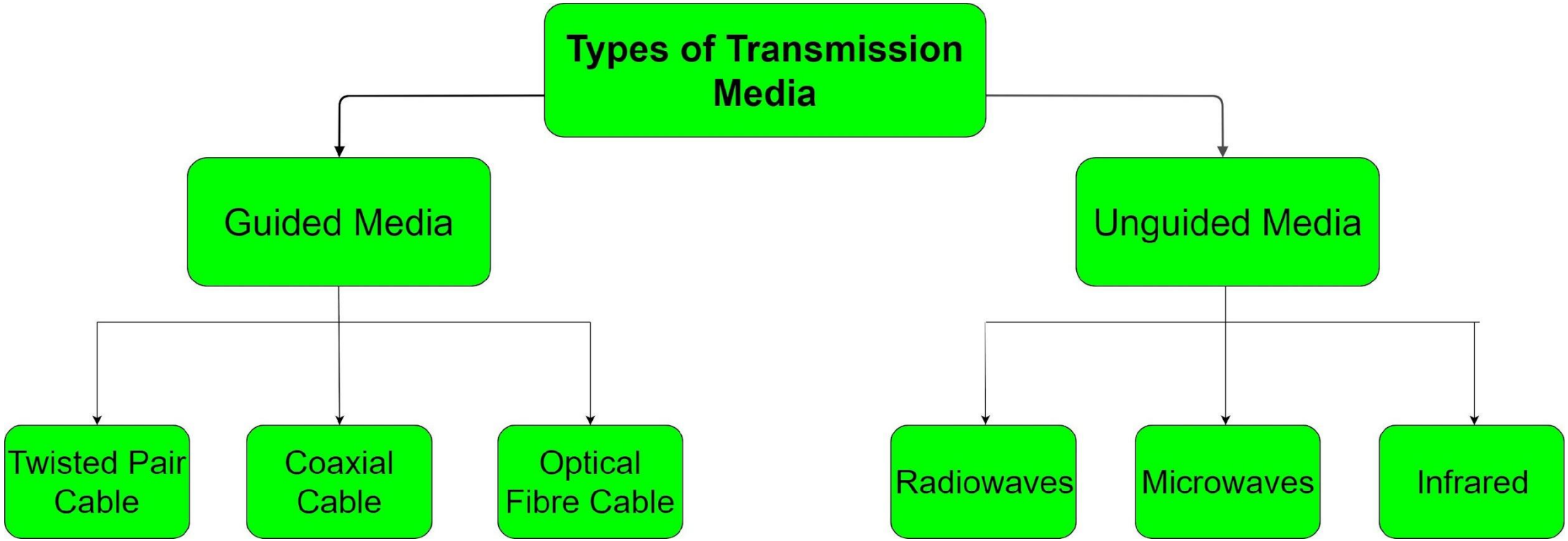
Figure: Block diagram of analog communication system

Shannon Hartley Channel capacity theorem:

Channel capacity is defined as the maximum rate at which information may be transmitted without error through the channel.

$$c = B\ log_2\ (1 + SNR)$$

A channel bandwidth defines as the range of frequencies that the channel can handle for the transmission of signals with reasonable fidelity.



Guided Media:

It is also referred to as Wired or Bounded transmission media. Signals being transmitted are directed and confined in a narrow pathway by using physical links.

Features:

- High Speed
- Secure
- Used for comparatively shorter distances

Unguided Media:

It is also referred to as Wireless or Unbounded transmission media. No physical medium is required for the transmission of electromagnetic signals.

Features:

- Signal is broadcasted through air
- Less Secure
- Used for larger distances

Noise (Internal and External)

Internal Noise

- Thermal noise
- Shot noise
- Partition noise
- Flicker or low frequency noise
- Transit time or HF noise
- Generation-Recombination noise

External Noise

- Atmospheric noise
- Galactic noise
- Industrial noise

Fundamental limitation of communication system:

- Noise limitation
- Bandwidth limitation
- Equipment limitation

Interference

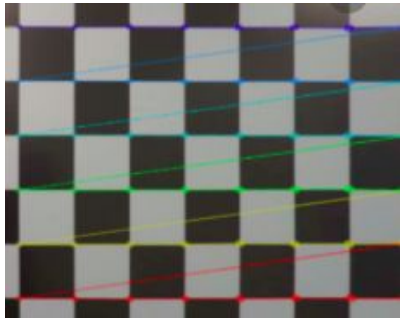
Interference is that which modifies a signal or waveform in a disruptive manner, as it travels along a channel between its transmitter and receiver. The term is often used to refer to the addition of unwanted signals to a useful signal.

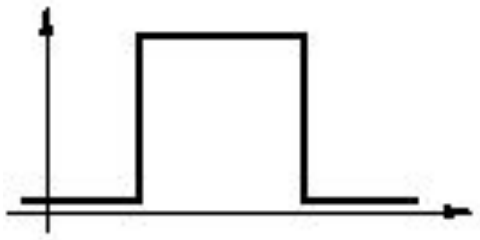
There are three basic types of interference:

- Radio frequency interference (RFI),
- Electrical interference and
- Intermodulation interference.

Distortion:

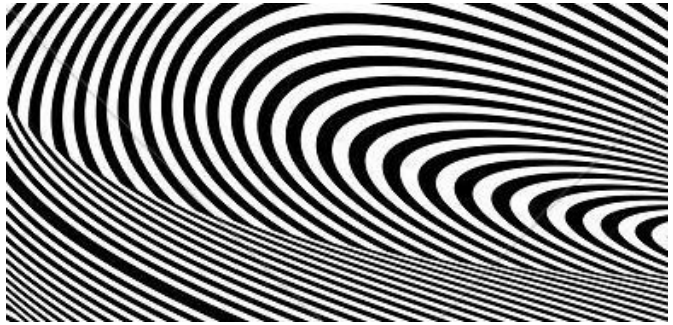
- **Distortion**, in electronics is defined as any change in a signal that alters the basic waveform or the relationship between various frequency components; it is usually a degradation of the signal.





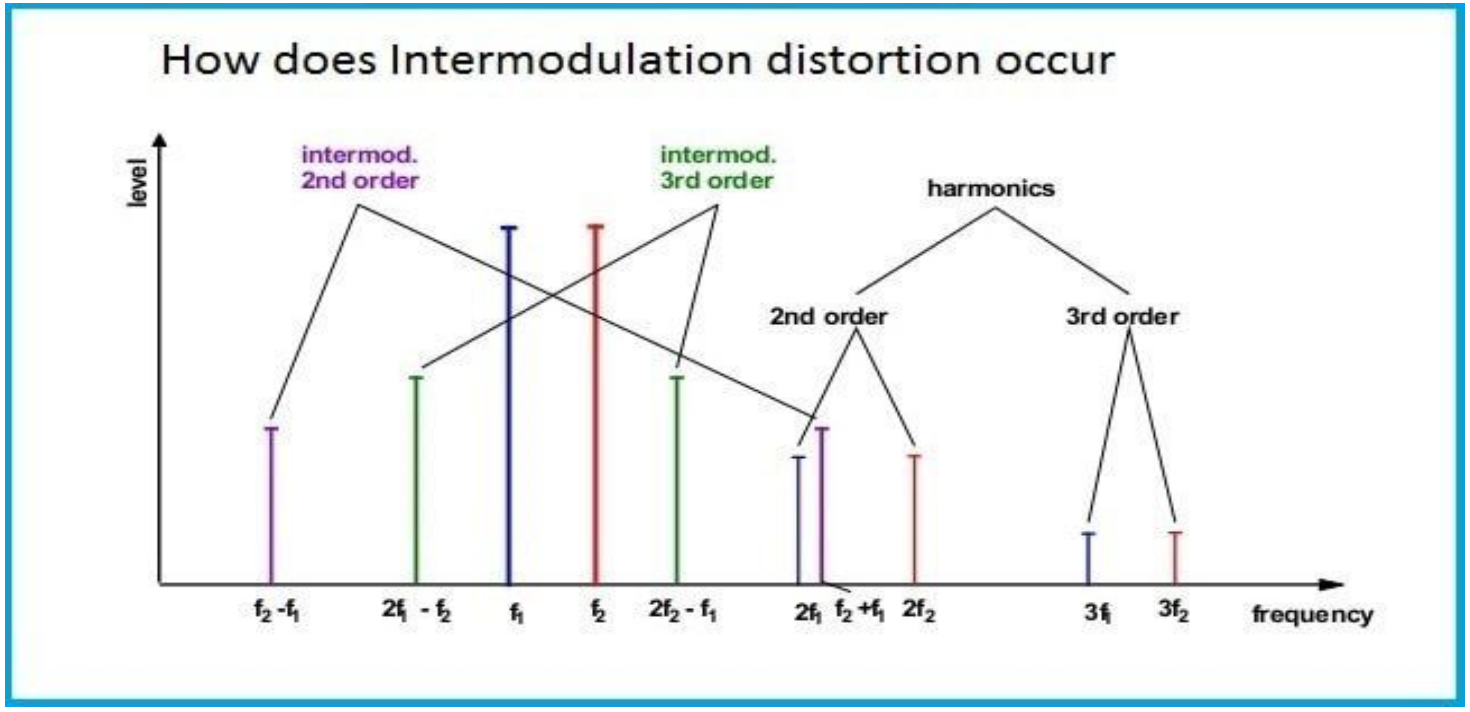
Transmitted Signal

Received Signal Distorted by Capacitance and Inductance of Copper Cable

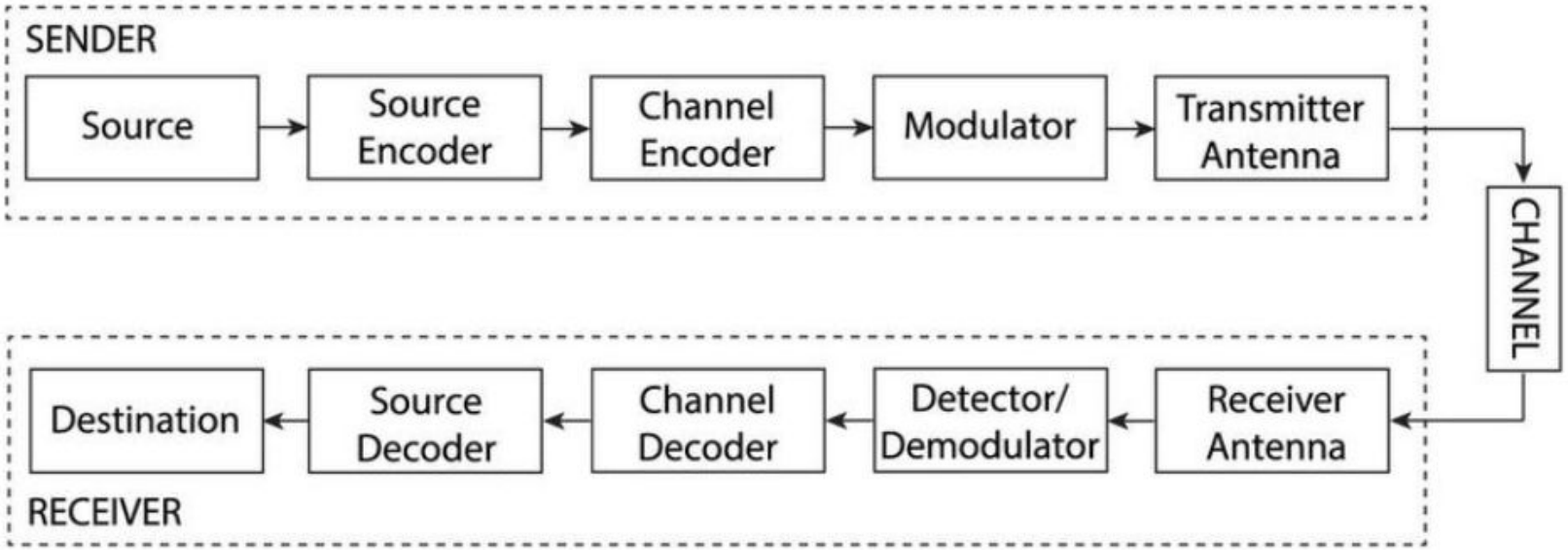


Limitation due to noise, distortion and Interference

- Degradation of system performance
- Alteration of sound which reduces user discomfort
- Irritation due to random noise
- Quality of received signal is bad.



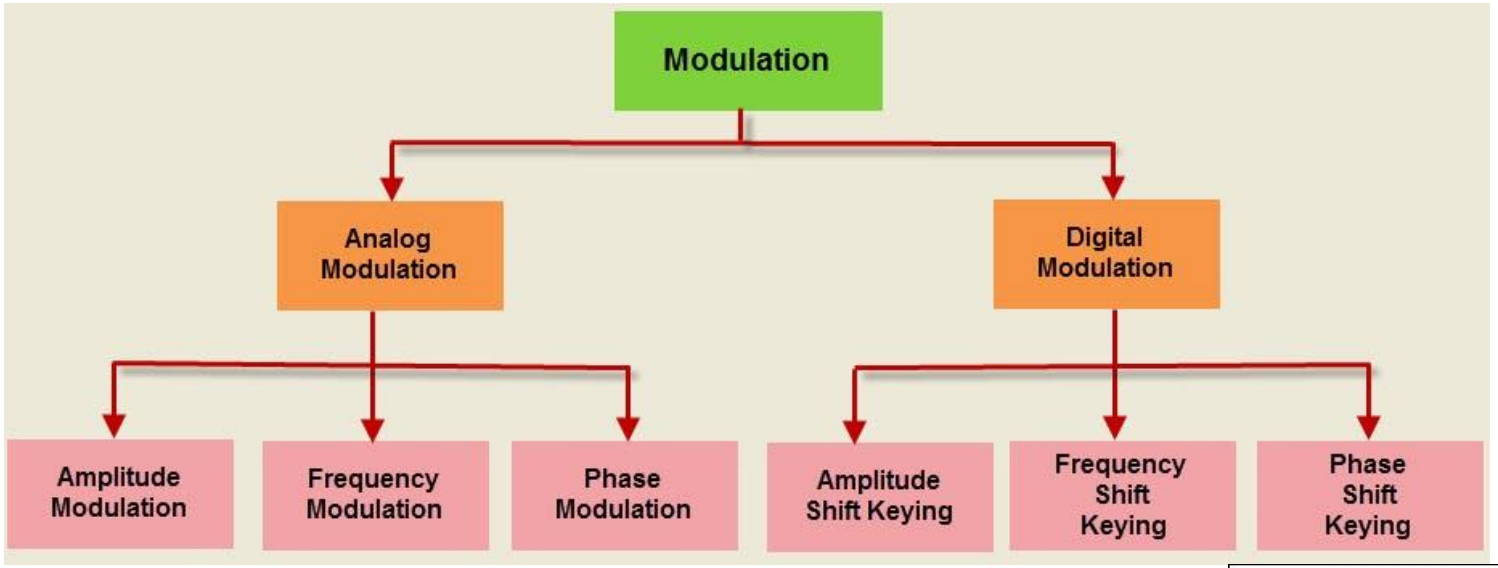
Block Diagram of Digital Communication System

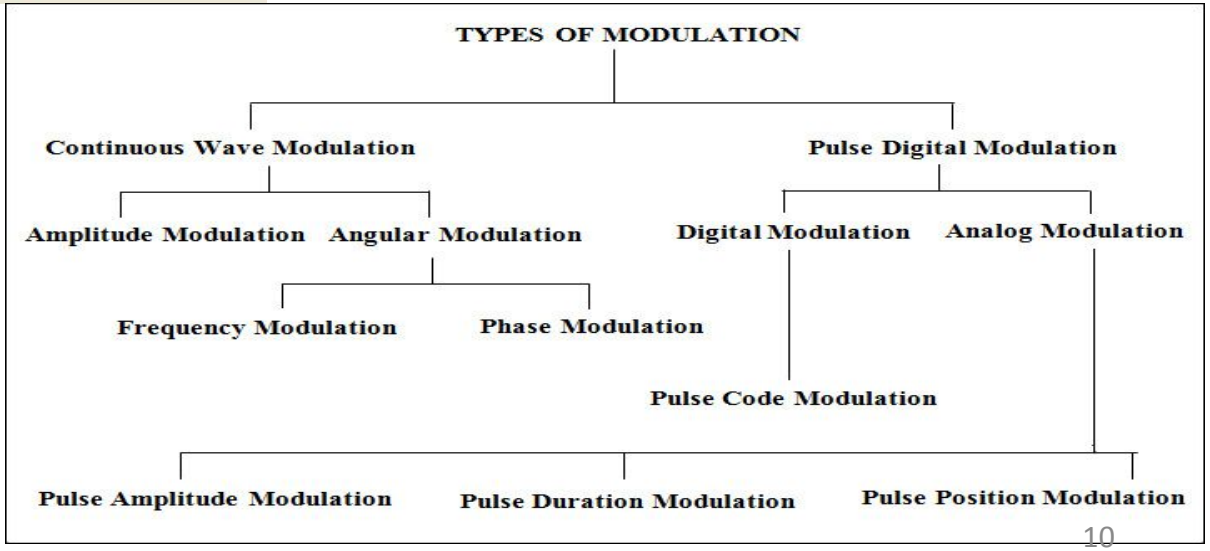


- The effect of distortion, noise, and interference is much less in digital signals as they are less affected
- Digital circuits are easy to design and cheaper than analog circuits.
- Better security than Analog
- Error checking mechanism can be employed easily in Digital system
- Digital signals can be saved and retrieved more conveniently than analog signals.

Modulation:

Modulation is a process in which the feature (amplitude, phase or frequency) of the carrier signal is changed in accordance with instantaneous value of **modulating** signal.





Need for Modulation:

- Size or height of the Antenna
- Frequency division multiplexing
- Less interference from other signals
- Transmit the information to long distance without interference.
- Reduce bandwidth.
- Narrow Banding

Advantage of Analog Communication system:

- Simple
- Low bandwidth
- Multiplexing can be used

Disadvantage:

- Unable to separate noise and signal
- Repeater can’t be used
- Encryption and Decryption technique can’t be used
- No security of transmitted data.

Assignment

1. History of Communication
2. Different types of distortion

Thank You