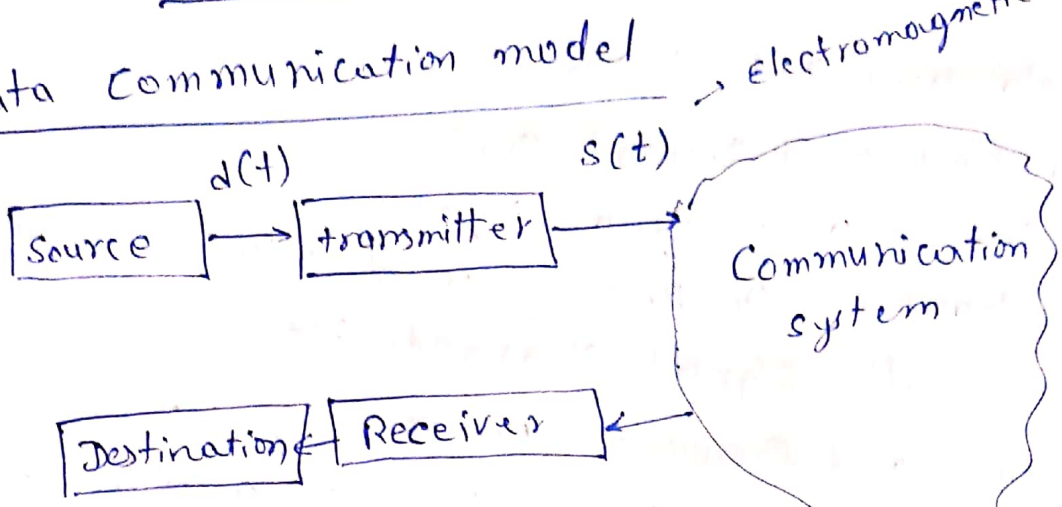
Lec - 1
13th Aug.

Data Communication & Network

Data Communication model



→ electromagnetic signal.

Data communication are the exchange of data between two devices via some form of transmission medium such as a wire cable or wireless.

1) source :- where the data is originated.
2) transmitter → converts data into a suitable form for transmission through the medium.
3) Communication system :- medium through which signal is sent.
4) Receiver → which receives the signals and converts it into data or message.
5) Destination :- where the data is sent.

Data communication system depends on four fundamental characteristices :-

1) delivery → correct destination
2) accuracy → data accurate.
3) timeliness → timely manner.
4) Jitter → uneven delay in the delivery of audio or video packets.

Data is something which convey some meaning to the receiver. Data can be Analog or digital.

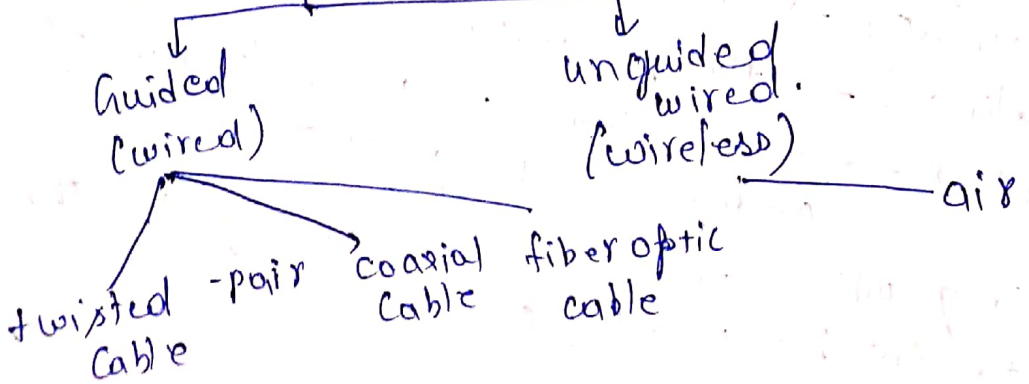
Data and signal

1) Data and Data types
2) Analog and Digital Data
3) Signal and signal types
4) Examples of Analog and digital signals
5) periodic signal Characteristics.
6) time and frequency domain representation
7) Spectrum and Bandwidth of a signal.
8) propagation time and wavelength.

transmission impairments and channel capacity.

1) Source of impairment
2) Attenuation and unit of Attenuation
3) Bandwidth of a medium
4) Distortions. → delay distortion & time distortion
5) Data Rate limits.
6) Nyquist Bit Rate.
7) Bit Rate and Baud Rate.
8) Noise sources
9) Shannon Capacity in a noisy channel.

transmission media



Wireless transmission

- Radio wave
- microwaves
- infrared

Conversion techniques

Data	Signal	Approach
Digital	Digital	Encoding
Analog	Digital	encoding.
Analog	Analog	modulation
Digital	Analog	modulation

- What types of signal should we use
- It depends on the situation and available bandwidth.

Coding techniques :-

Digital - Digital

Line coding
- Unipolar
- polar
- Bipolar.

Polar
- NRZ
- RZ
- manchester
- Differential manchester

Bipolar
- AMI
- B8ZS
- HDB3

Analog data to digital signal

Voice, Video

two basic Approaches :-

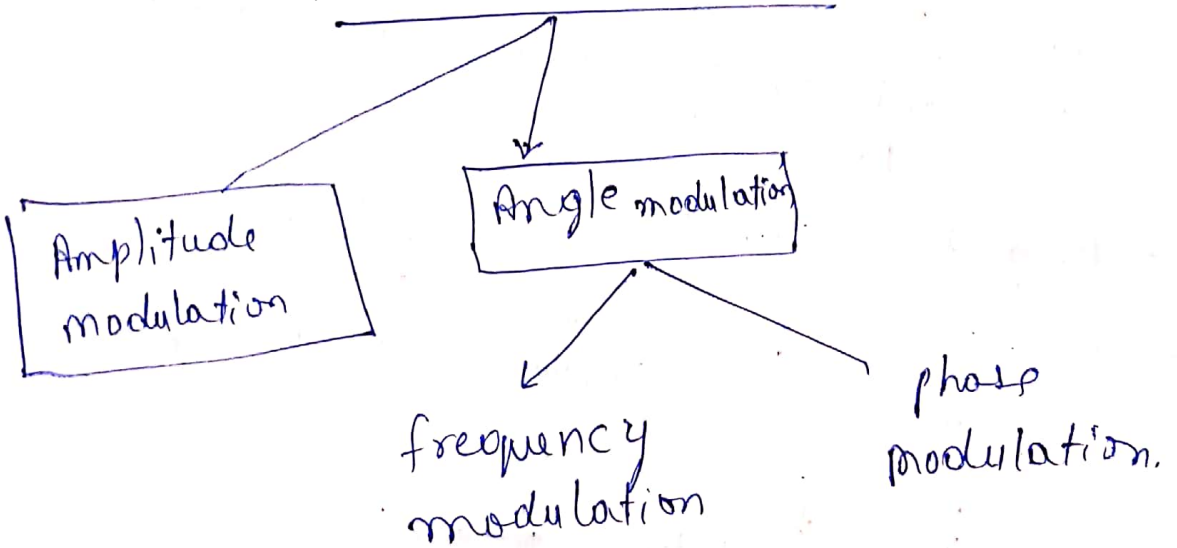
→ Pulse Code modulation

→ Delta modulation.

- Limitation of PCM and DM
- Comparison of the two approaches.

Analog Data to Analog signal

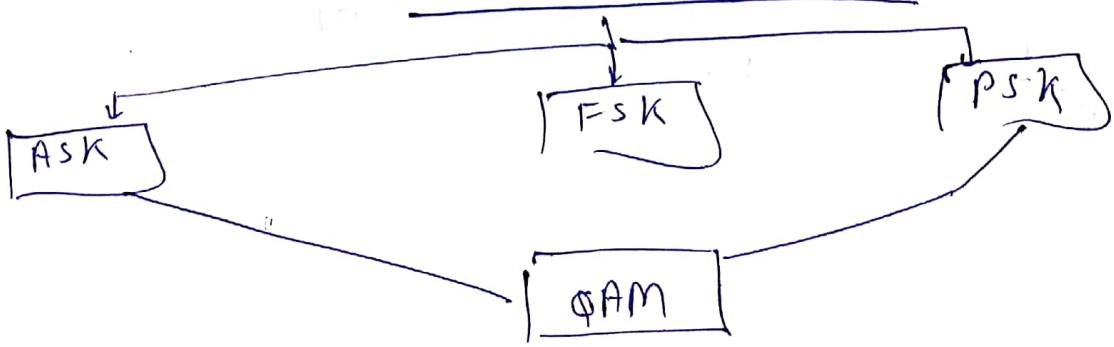
Modulation techniques



Analog signal → Amplitude, Phase, frequency.

Digital to analog modulation

Modulation techniques



Multiplexing techniques

1) Basic concepts of multiplexing
2) frequency Dirision multiplexing
3) wavelength Dirision multiplexing
4) time Division multiplexing
   → synchronous
   → Asynchronous
5) inverse TDM.

Multiplexing Applications

1) the telephone system
   - Analog services
   - Digital services.
2) DSL technology : ADSL, SDSL, HDSL and VDSL
3) Cable modem
   - Hybrid fiber - coaxial (HFC) Networks
4) SONET