

21ES614 – Internet of Things

Sivraj P, Asst. Professor,
Dept. of EEE, Amrita School of Engineering
Amrita Vishwa Vidyapeetham

Syllabus

Unit 1

Introduction to IoT - Definitions, frameworks and key technologies. Functional blocks of IoT systems: hardware and software elements- devices, communications, services, management, security, and application. Challenges to solve in IoT

Unit 2

Basics of Networking & Sensor Networks - Applications, challenges - ISO/OSI Model, TCP/IP Model, Sensor network architecture and design principles, IoT technology stack, Communication models. **Communication Protocols - Overview of protocols in each layer, Application protocols for the transfer of sensor data, Infrastructure for IoT: LoRa-Wan, 6LoWPAN, 5G and Sigfox.**

Unit 3

Introduction to Cloud, Fog and Edge Computing. **Modern trends in IoT – Industrial IoT, Wearable. Applications of IoT - Smart Homes/Buildings, Smart Cities, Smart Industry, and Smart Medical care, Smart Automation etc.**

Physical Layer - Revisiting

- Representation of bits
- Signal Generation & Reception
- Data rate / Transmission rate
- Line configuration – Point-to-Point / Multipoint
- Transmission Mode - Simplex / Half-Duplex / Full-Duplex
- Physical Layer devices - Hub, Repeater, Modem, Cables, etc.

Ref: <https://networkhope.in/iso-osi-basic-reference-model/>

<http://cs.uok.edu.in/Files/79755f07-9550-4aeb-bd6f-5d802d56b46d/Custom/ADC%20unit%202.pdf>

<https://www.studytonight.com/computer-networks/complete-osi-model>

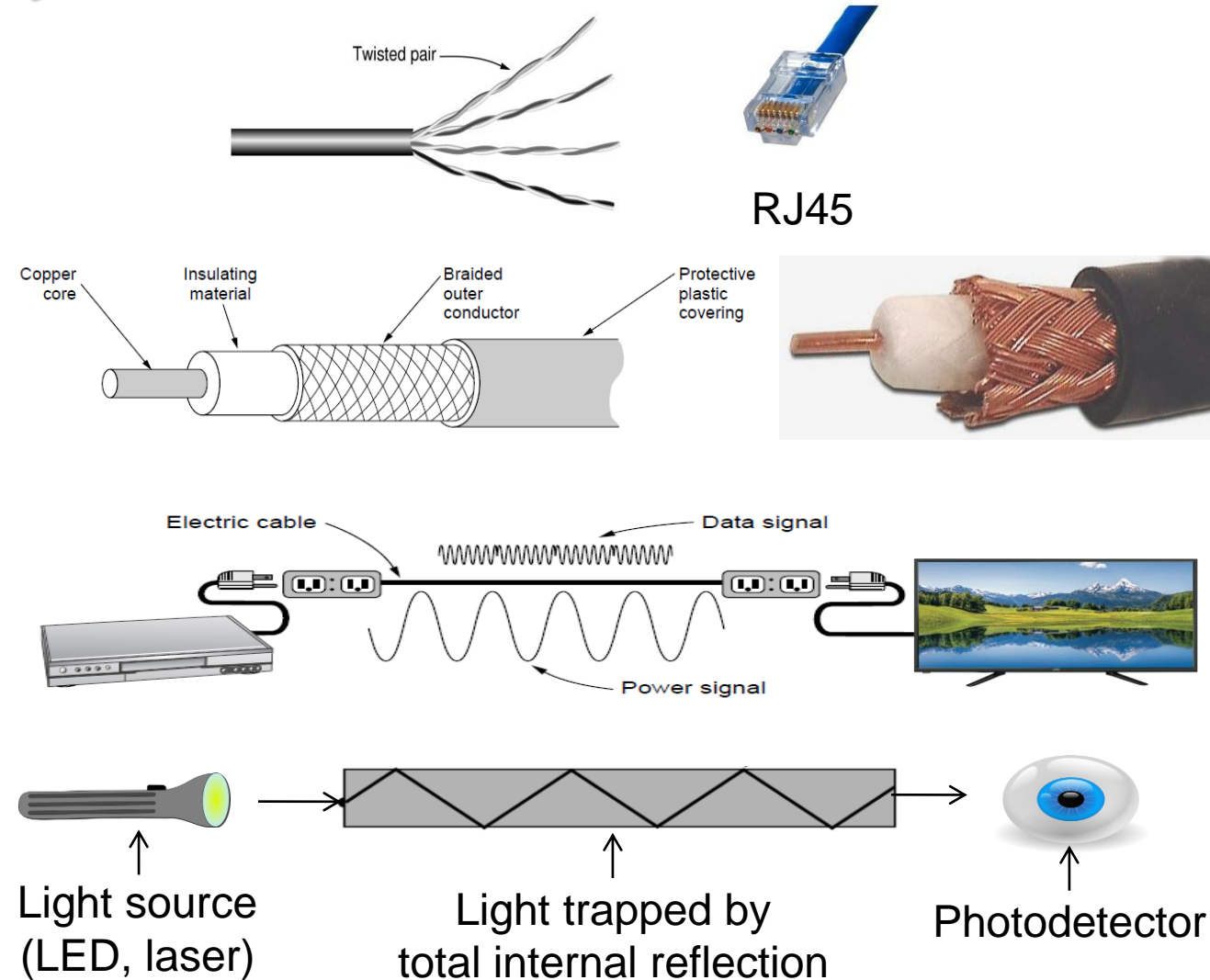
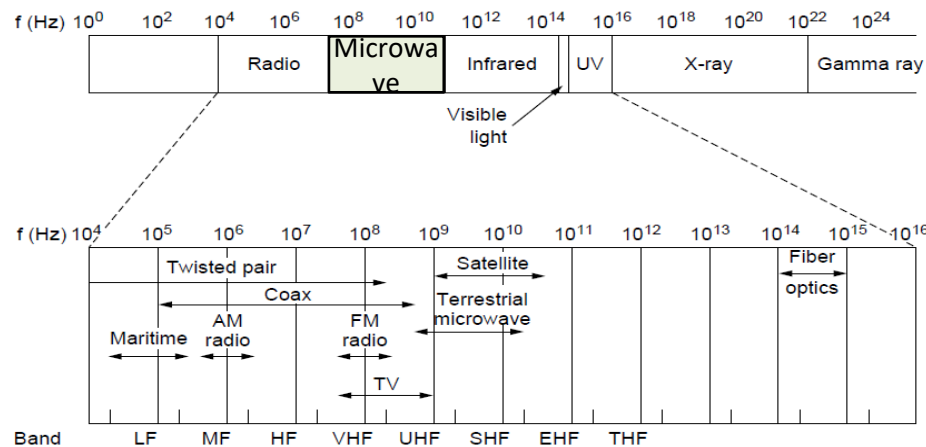
<https://www.geeksforgeeks.org/layers-of-osi-model/>

Physical Layer - Medium

- Wired

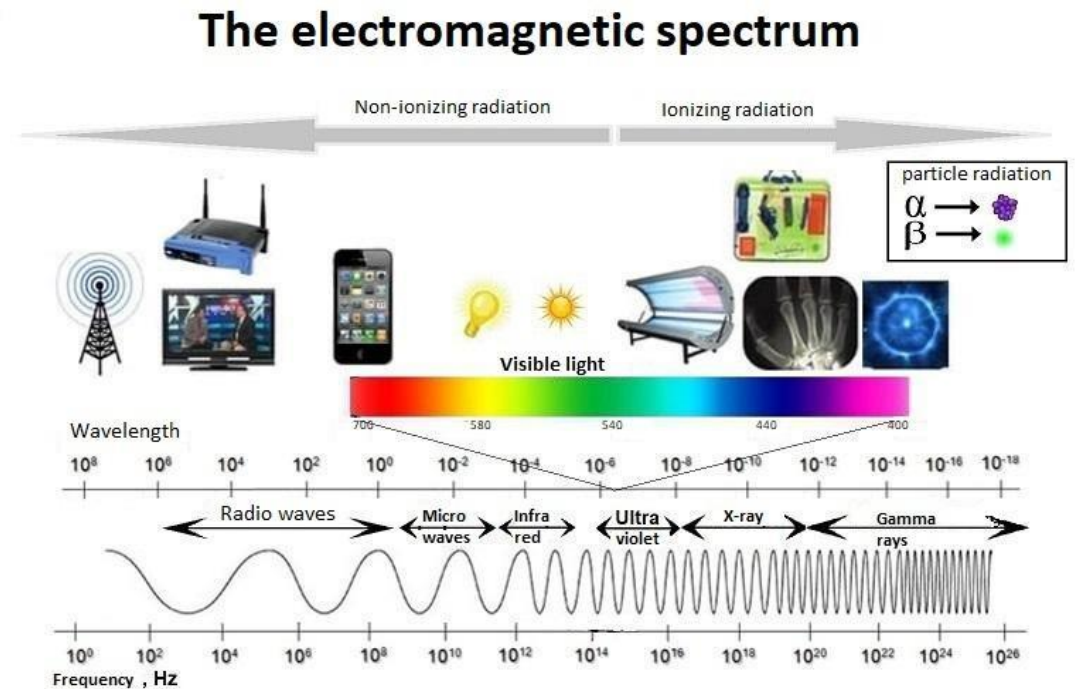
- Twisted copper pair cable
- Coaxial cable
- Power line cable
- Fibre optic

- Wireless



Physical Layer - Signals

- Wired
 - Twisted copper pair cable – Electrical
 - Coaxial cable – Electrical
 - Power line cable – Electrical
 - Fibre optic – Light
- Wireless
 - Electromagnetic waves

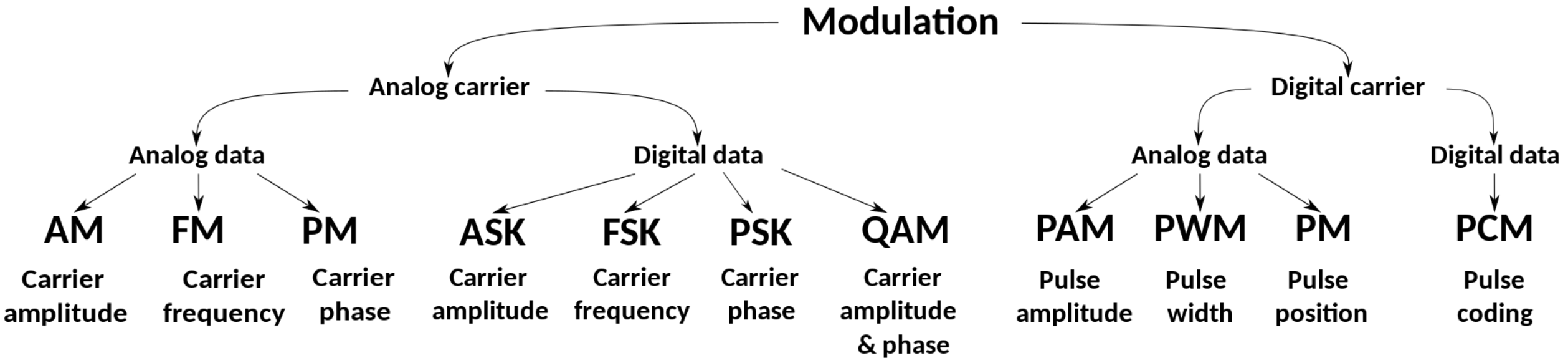


Ref: <http://cs.uok.edu.in/Files/79755f07-9550-4aeb-bd6f-5d802d56b46d/Custom/ADC%20unit%202.pdf>
<https://www.geeksforgeeks.org/data-communication-definition-components-types-channels/>
<https://ncert.nic.in/textbook/pdf/lecs111.pdf>

Image Courtesy: <https://www.uib.no/en/hms-portalen/75292/electromagnetic-spectrum>

Modulation / De-modulation - Revisiting

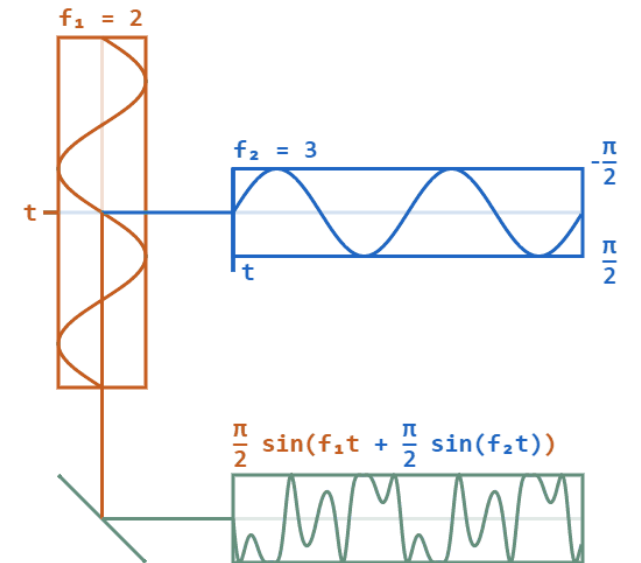
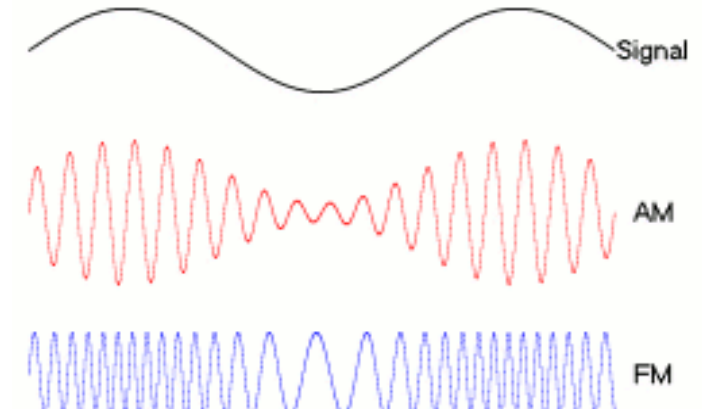
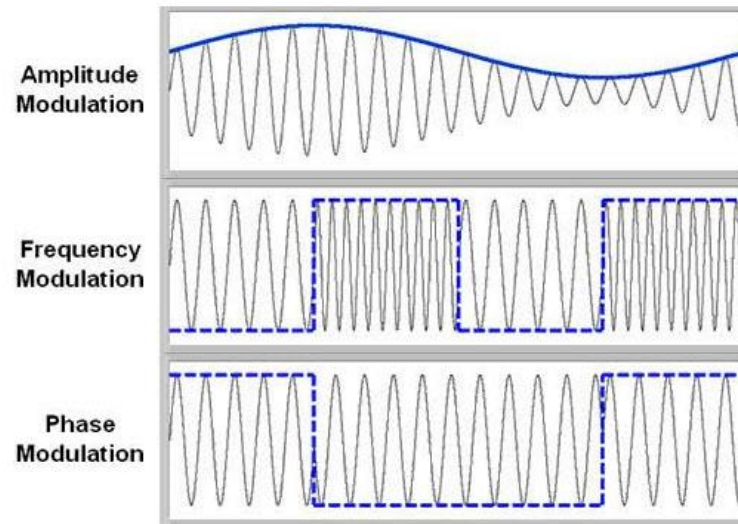
- Signal Amplitude, Phase, Frequency, etc.
- Analog, Digital, Pulse
- Spread Spectrum Method



Ref & Image Courtesy: <https://en.wikipedia.org/wiki/Modulation>

Modulation / De-modulation

- Analog Modulation
 - Amplitude modulation
 - Frequency modulation
 - Phase modulation



Ref: https://en.wikipedia.org/wiki/Amplitude_modulation

https://en.wikipedia.org/wiki/Phase_modulation

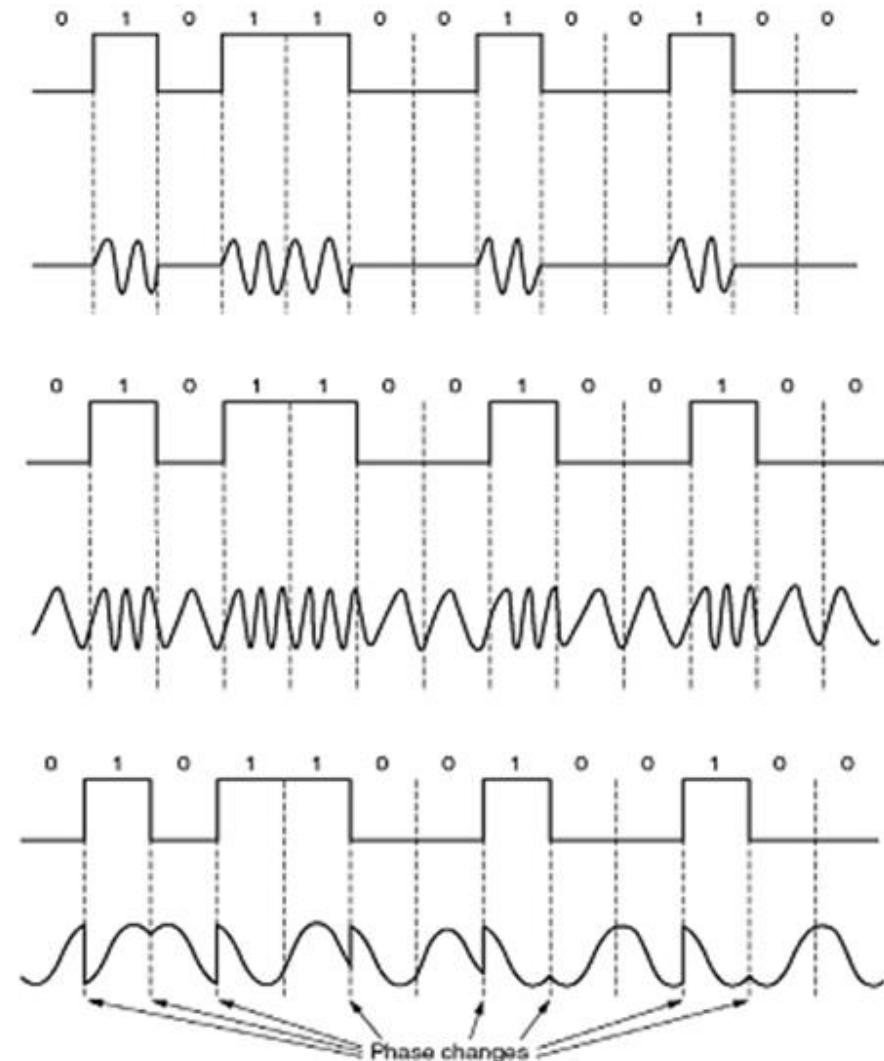
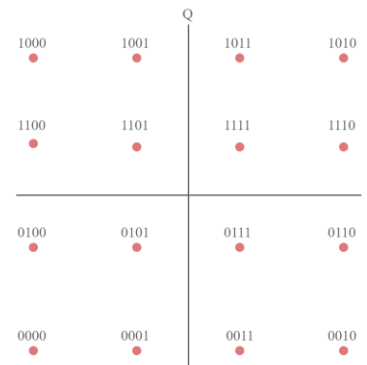
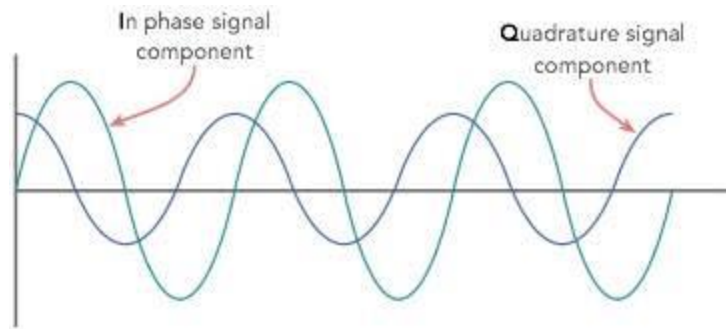
<https://www.elprocus.com/different-types-of-modulation-techniques-in-communication-systems/>

12/19/2023

Department of EEE, Amrita School of Engineering, Coimbatore.

Modulation / De-modulation

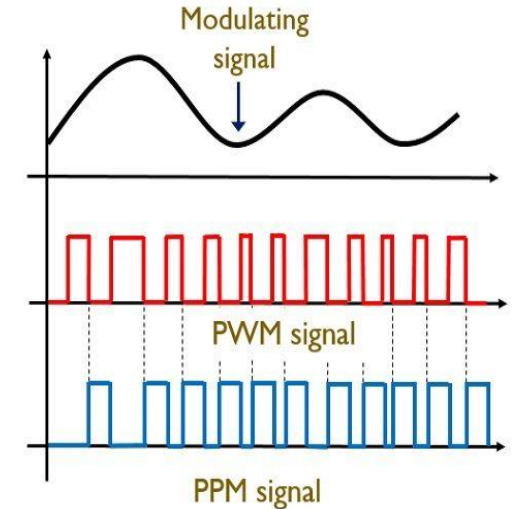
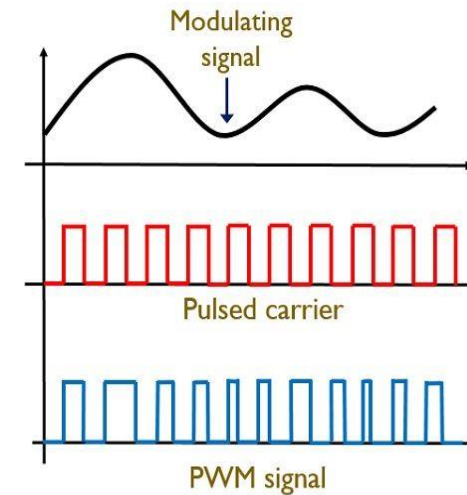
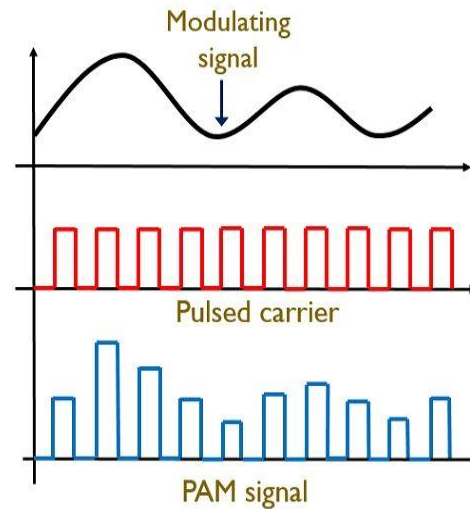
- Digital Modulation
 - Amplitude-shift keying
 - Frequency-shift keying
 - Phase-shift keying
 - Quadrature Amplitude



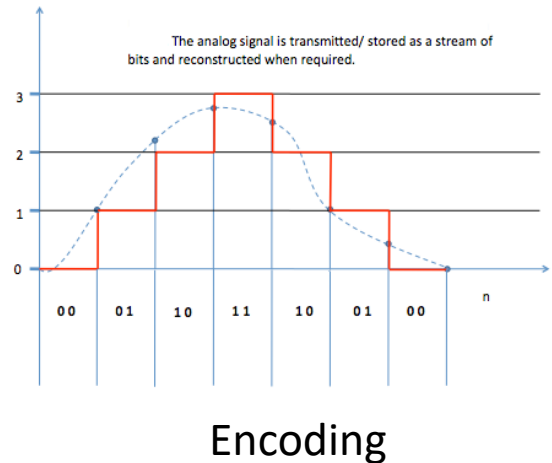
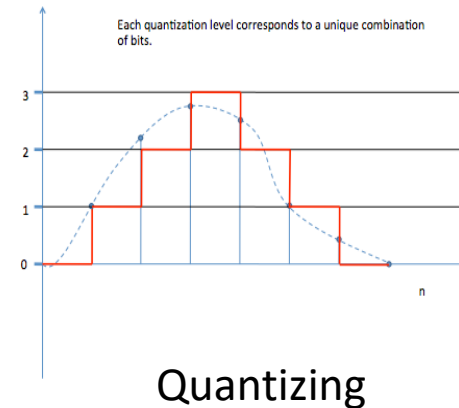
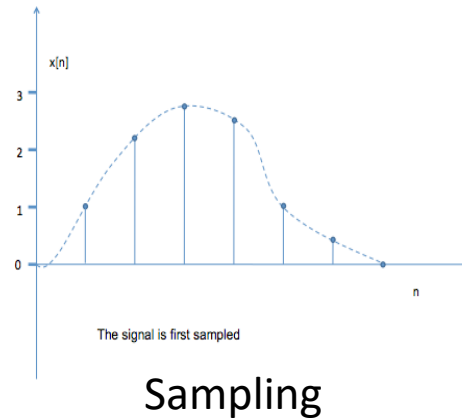
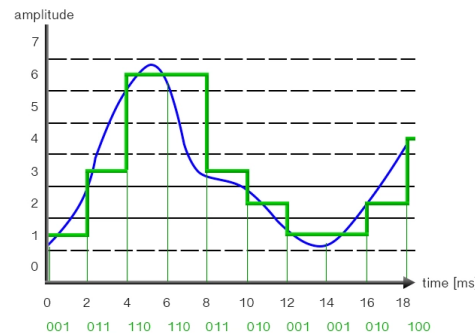
Modulation / De-modulation

- Pulse Modulation

- Pulse Amplitude
- Pulse Width
- Pulse Position



- Pulse-Code



Ref: <https://circuitglobe.com/difference-between-pam-pwm-and-ppm.html>

https://www.tutorialspoint.com/principles_of_communication/principles_of_communication_analog_pulse_modulation.htm

<https://www.eeweb.com/pulse-code-modulation-pcm/>

Modulation / De-modulation

- Spread Spectrum Method
 - Direct Sequence
 - Frequency Hopping

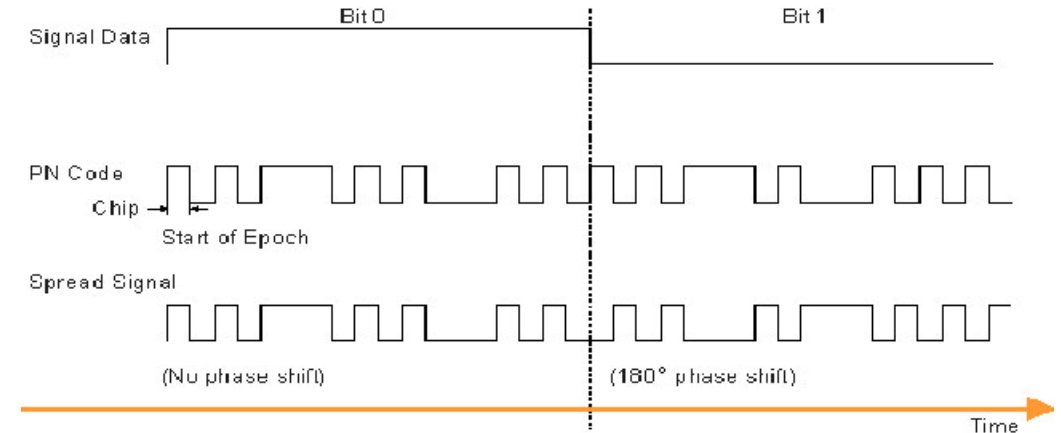
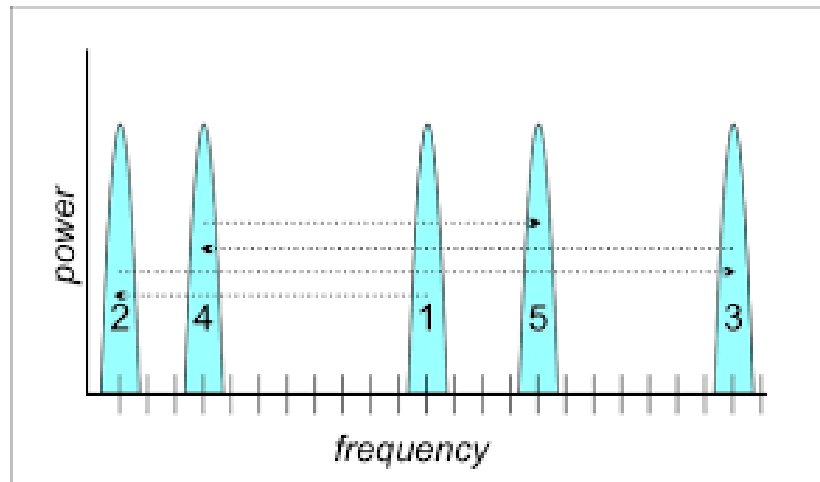


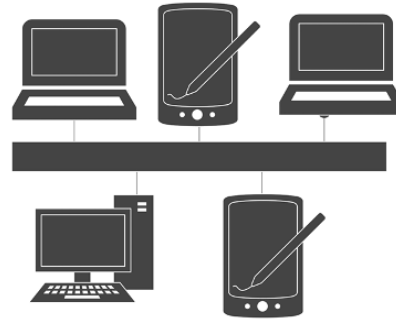
Figure 1: Direct sequence signals

Ref: <https://www.csitweb.com/spread-spectrum-technology-dsss-fhss-ofdm/>
<http://www.myreadingroom.co.in/notes-and-studymaterial/68-dcn/778-spread-spectrum-techniques.html>
https://www.tutorialspoint.com/digital_communication/digital_communication_spread_spectrum_modulation.htm

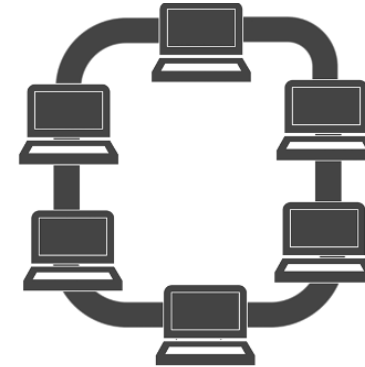
IEEE 802.3 – Network Topologies



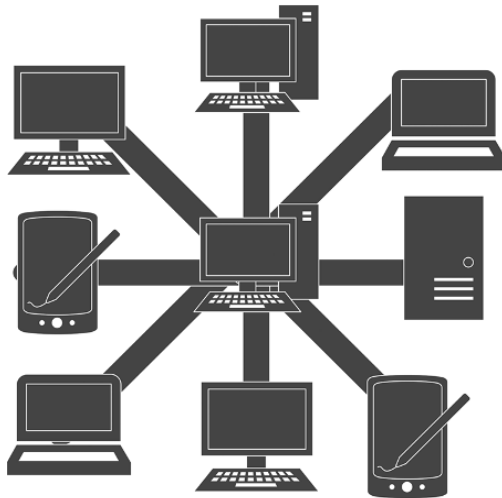
Point to Point



Bus



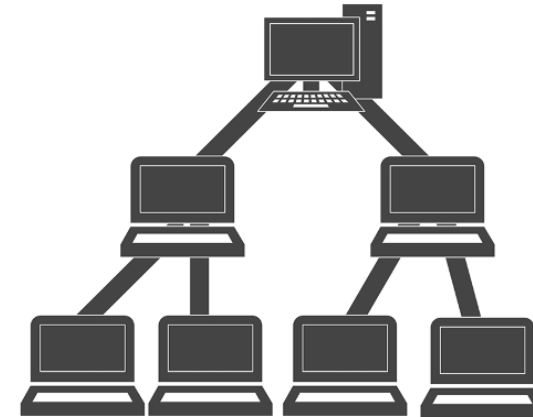
Ring



Star

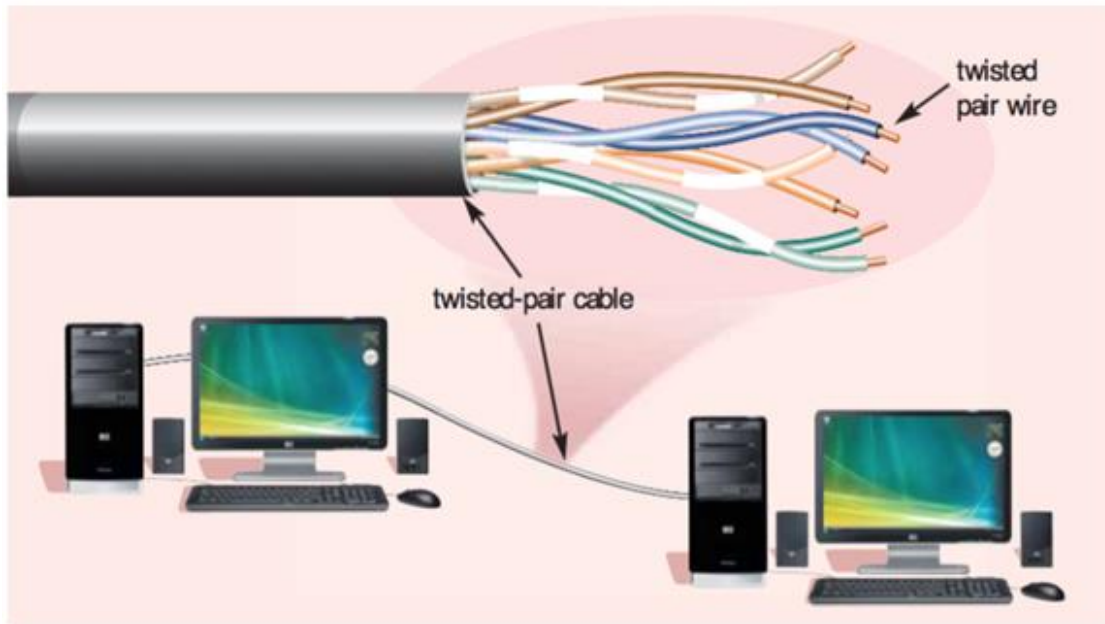


Mesh

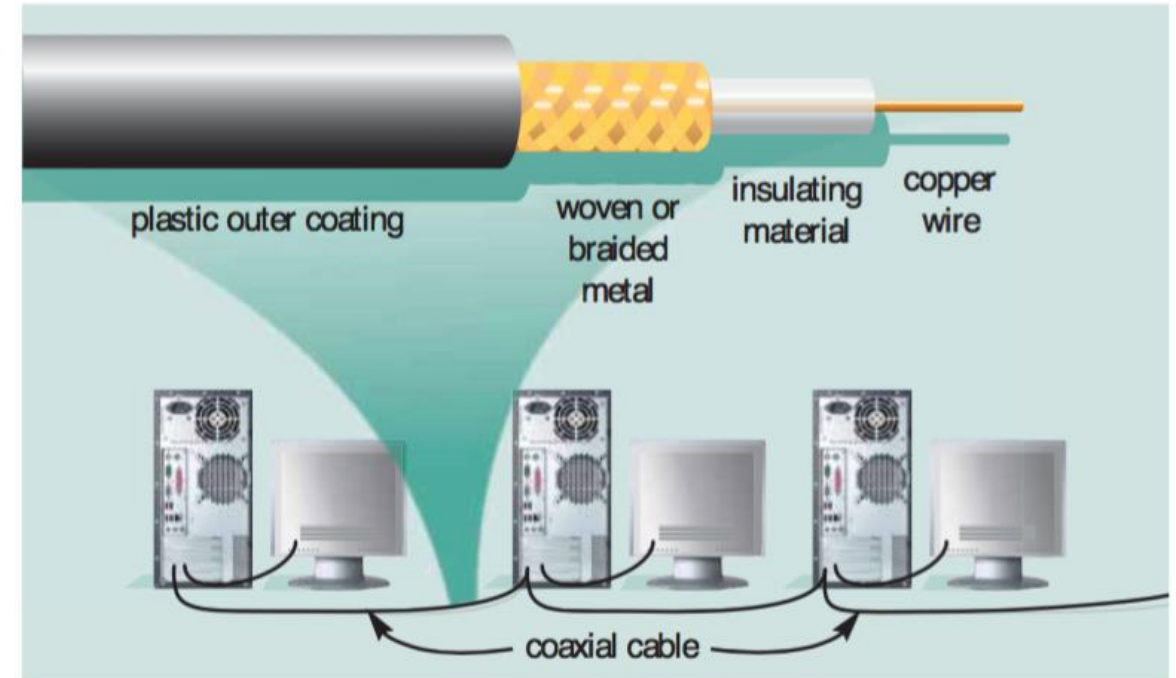


Tree

Physical Layer - Medium

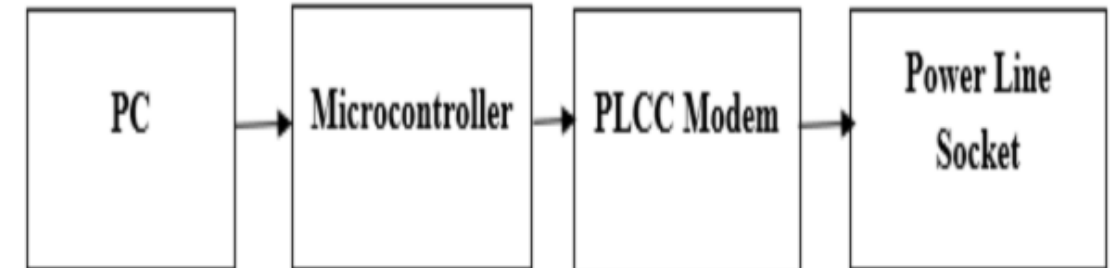
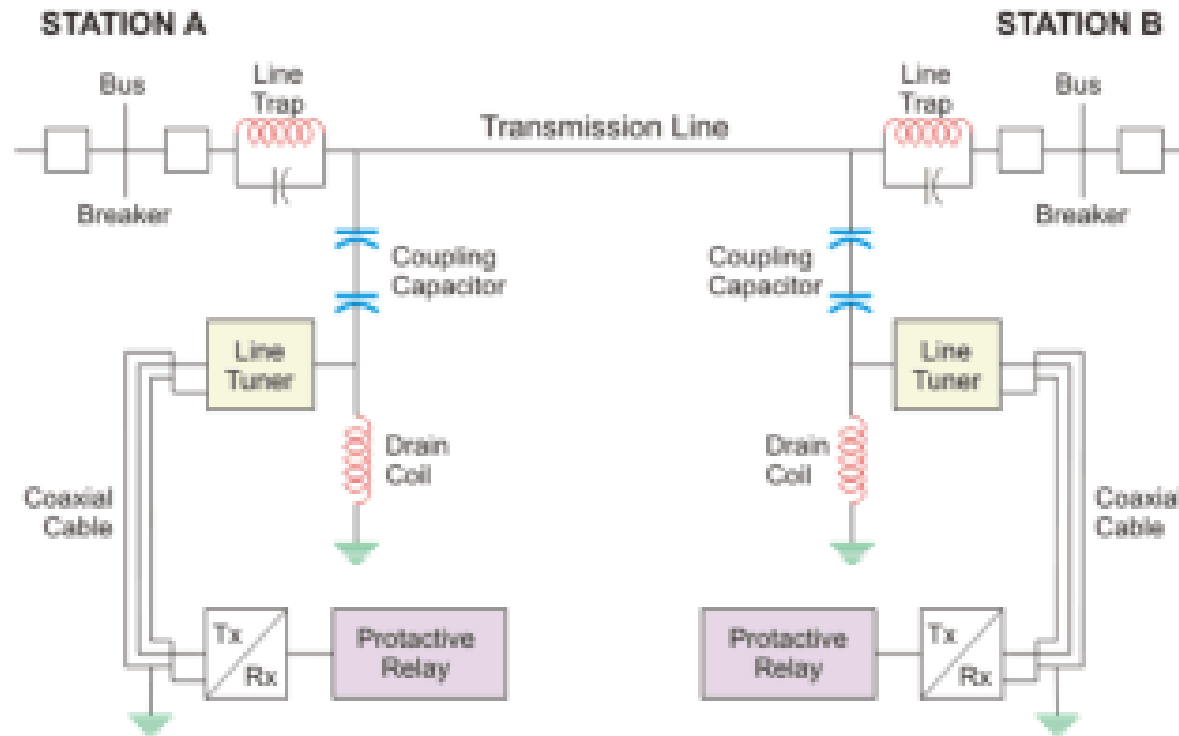


A twisted-pair cable consists of one or more twisted-pair wires. Each twisted-pair wire usually is color coded for identification.

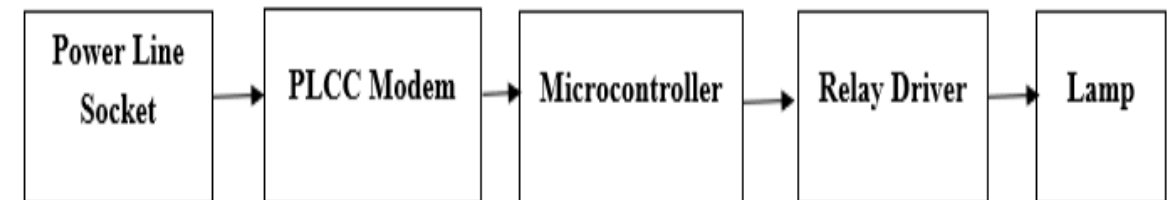


On a coaxial cable, data travels through a copper wire. This illustration shows computers networked together with coaxial cable.

Physical Layer - Medium



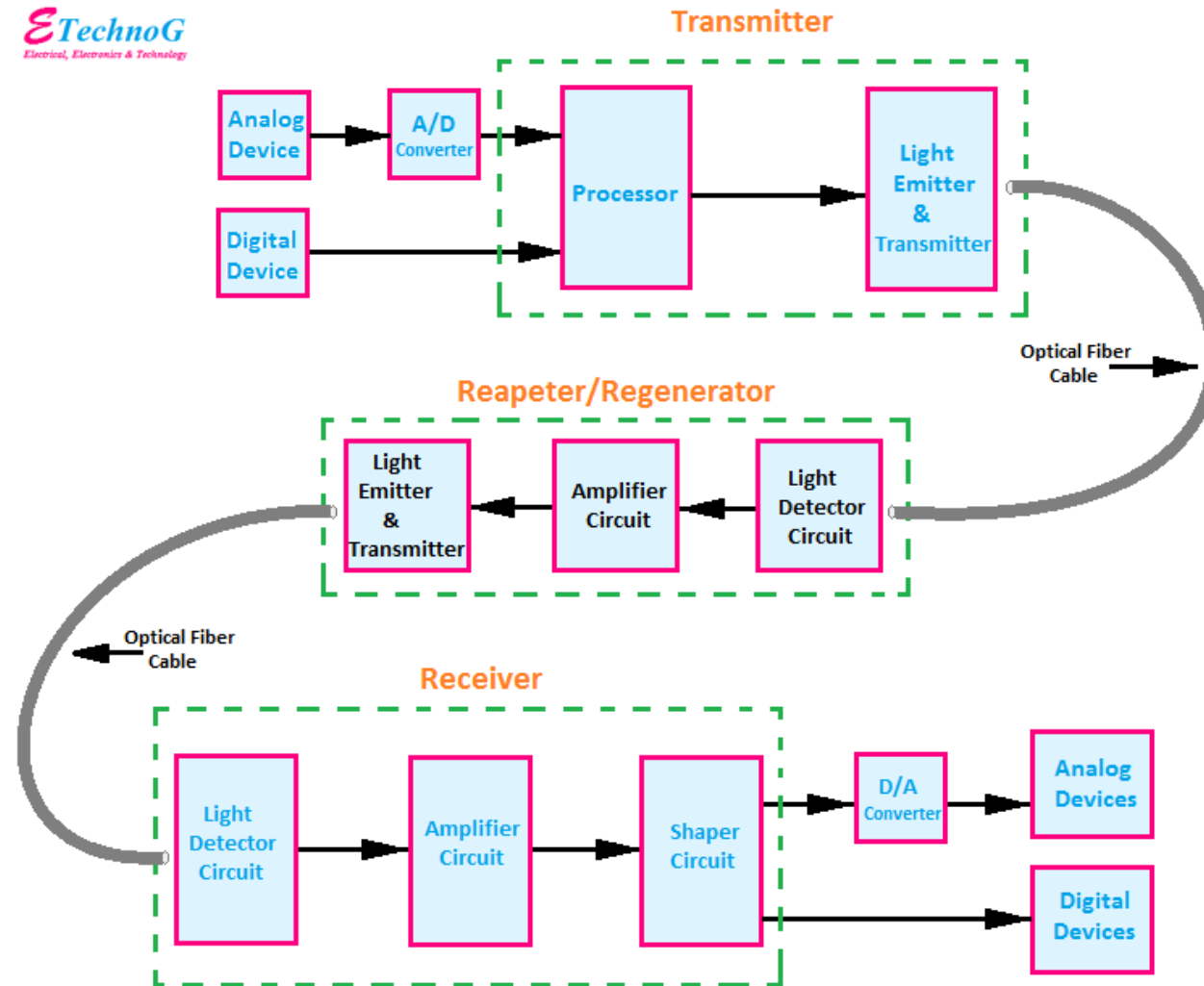
©Elprocus.com



©Elprocus.com

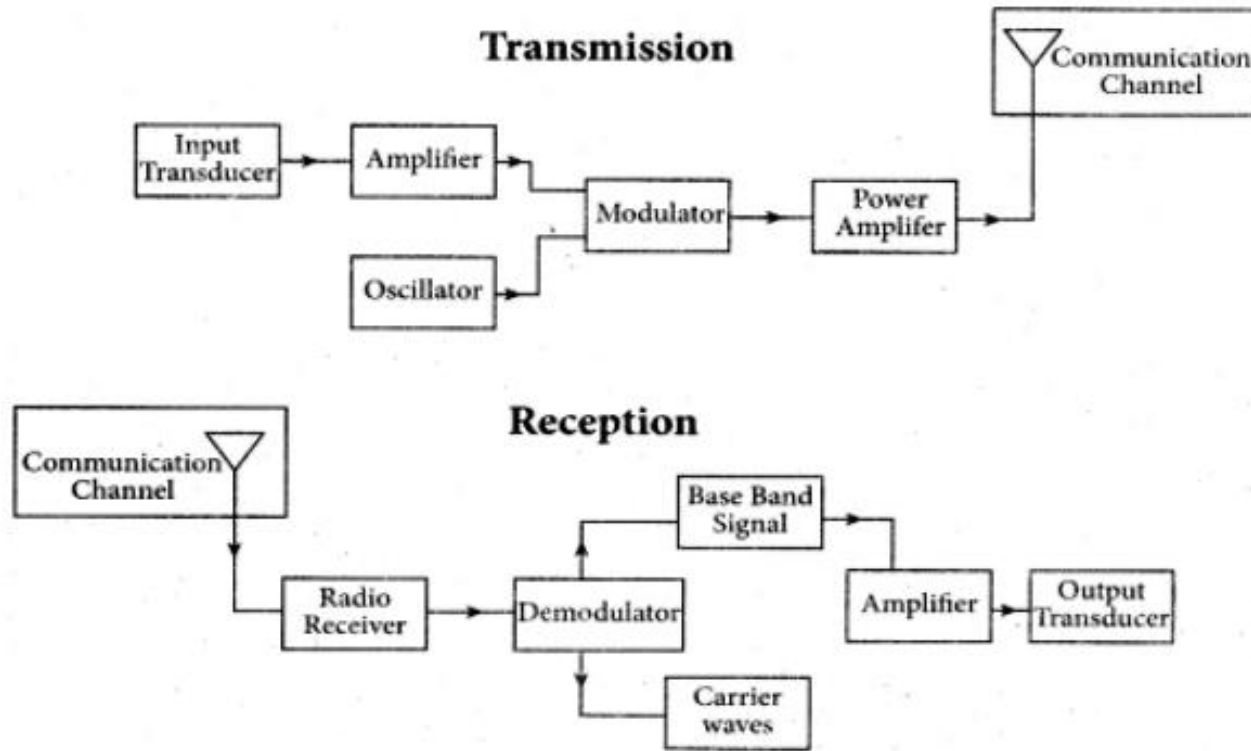
Physical Layer - Medium

ETechnoG
Electrical, Electronics & Technology



Optical Fiber Communication Block Diagram

Physical Layer - Medium



Block diagram of transmission and reception of voice signals

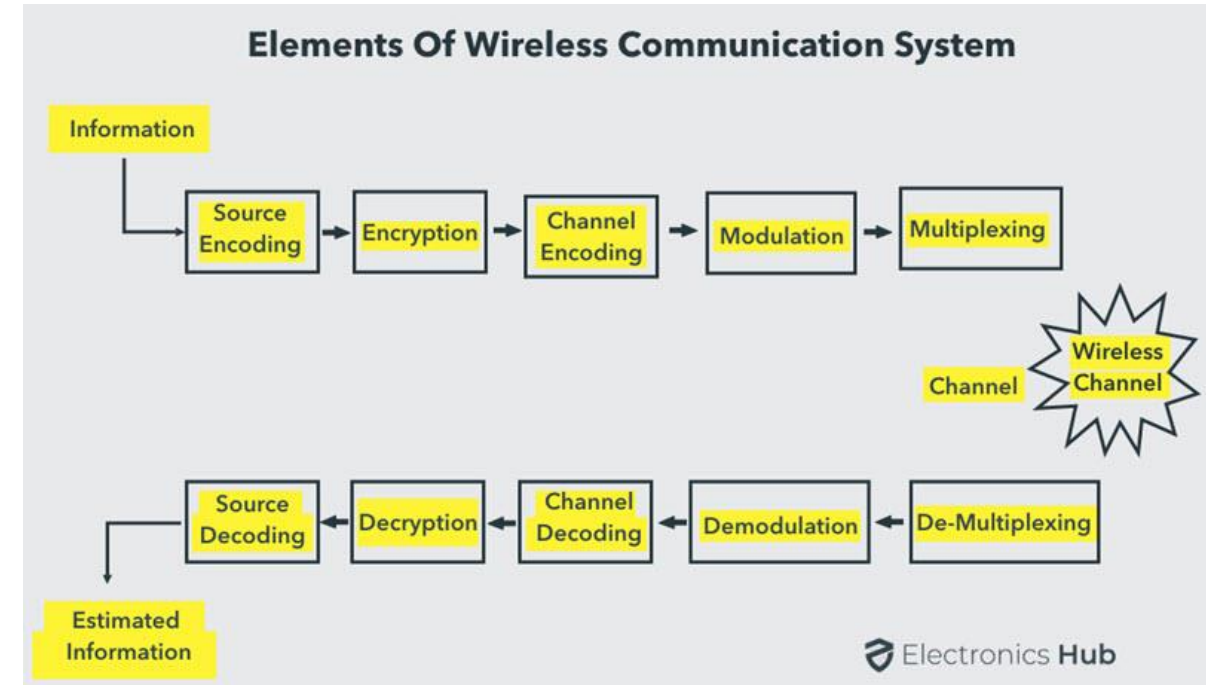


Image Courtesy:

<https://www.sarthaks.com/885255/elaborate-on-the-basic-elements-of-communication-system-with-the-necessary-block-diagram>

<https://www.electronicshub.org/wireless-communication-introduction-types-applications/>

Thank You...