Introduction to Information & Communication Technology

Concept of Bit & Byte
Digital Vs Analog Signal
Signal Transmission & its components
Baseband Vs Broadband Transmission
Positive & Negative Impacts of ICT
Digital Citizen & Citizenship
Digital Wellbeing
Audio Video Editing

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WELCOME

to those who wants to LEARN...

Concepts of Bit & Byte

Definition & Concepts

What do you understand?

"This computer has a 64-bit processor with 4 GB (Gigabytes) of RAM and 1 TB (Terabytes) of Hard disk"

Concept of Bit and Byte

Bit

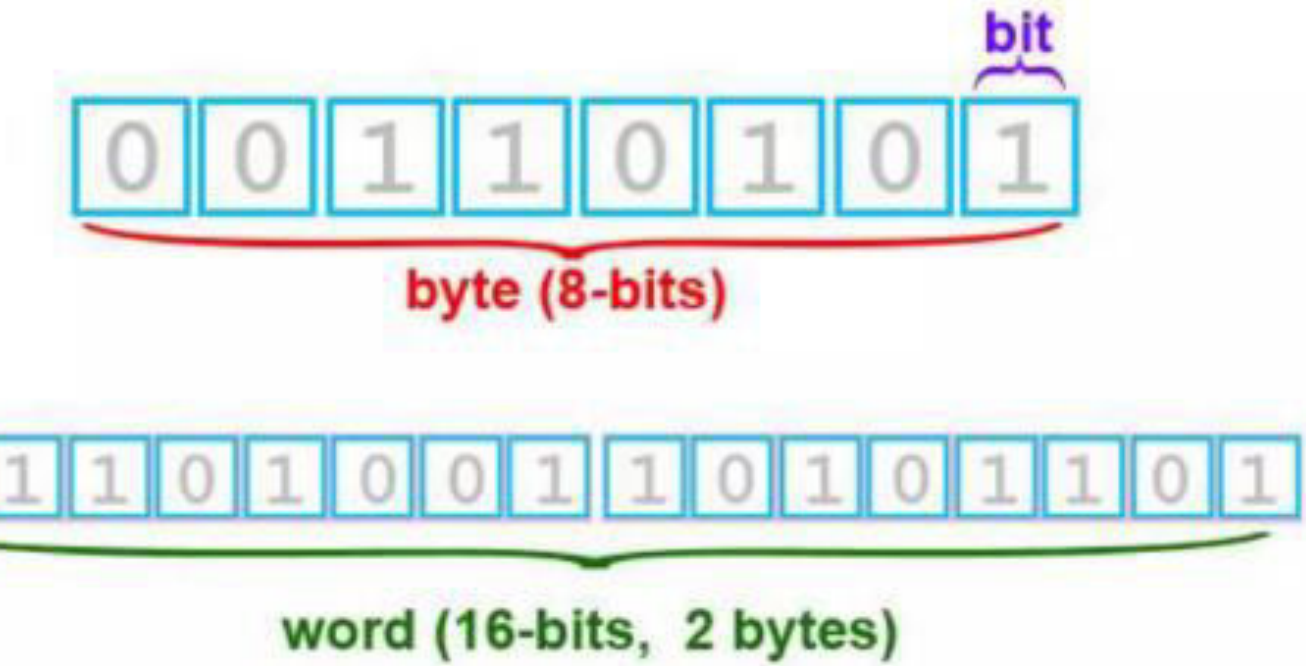
- short form of the words "binary digit"
- smallest and basic unit of information for computer
- only two possible values "0" or "1"

Concept of Bit and Byte

Byte

- word formed by combining 8 bits
- Each keyboard character is stored as a byte
- Ex. A = 01000001

This is an excellent diagram



Concept of Bit and Byte

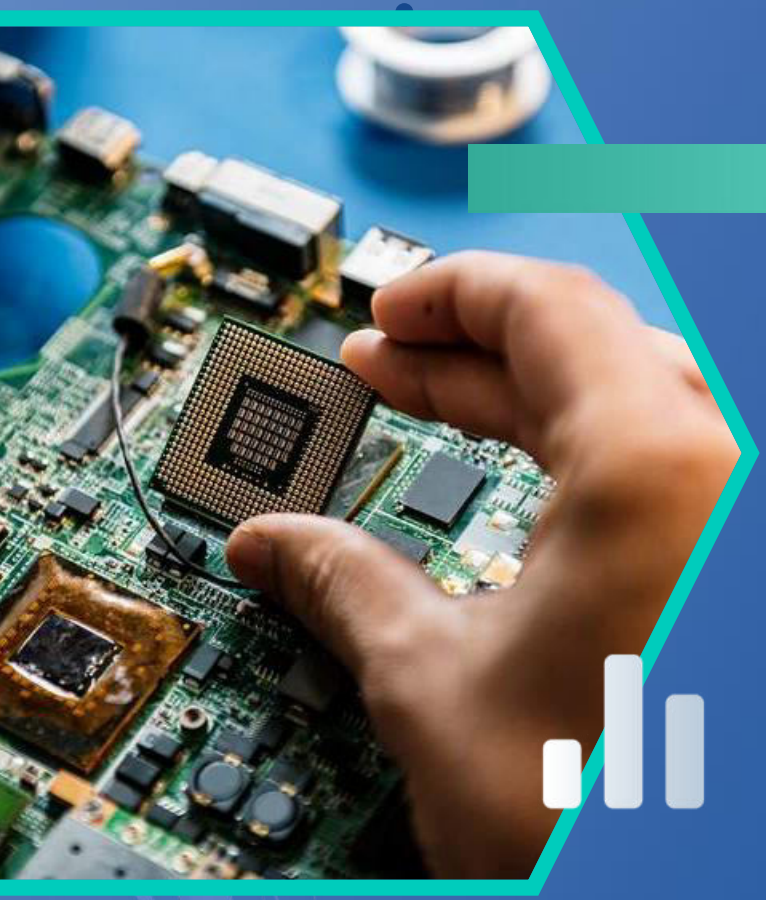
Hello
Everyone

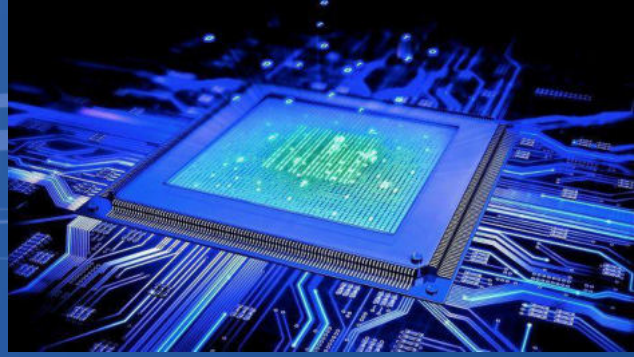
- 01001000 01100101 01101100
  01101100 01101111 00100000
  01000101 01110110 01100101
  01110010 01111001 01101111 01101110
  01100101

0 011 0000	A 100 0001	N 100 1110	a 110 0001	n 110 1110	. 010 1110
1 011 0001	B 100 0010	O 100 1111	b 110 0010	o 110 1111	, 010 1100
2 011 0010	C 100 0011	P 101 0000	c 110 0011	p 111 0000	! 010 0001
3 011 0011	D 100 0100	Q 101 0001	d 110 0100	q 111 0001	? 011 1111
4 011 0100	E 100 0101	R 101 0010	e 110 0101	r 111 0010	' 010 0111
5 011 0101	F 100 0110	S 101 0011	f 110 0110	s 111 0011	(010 1000
6 011 0110	G 100 0111	T 101 0100	g 110 0111	t 111 0100	) 010 1001
7 011 0111	H 100 1000	U 101 0101	h 110 1000	u 111 0101	- 010 1101
8 011 1000	I 100 1001	V 101 0110	i 110 1001	v 111 0110	" 010 0010
9 011 1001	J 100 1010	W 101 0111	j 110 1010	w 111 0111	space 010 0000
	K 100 1011	X 101 1000	k 110 1011	x 111 1000	
	L 100 1100	Y 101 1001	l 110 1100	y 111 1001	
	M 100 1101	Z 101 1010	m 110 1101	z 111 1010	

Computer Memory Measurement Units

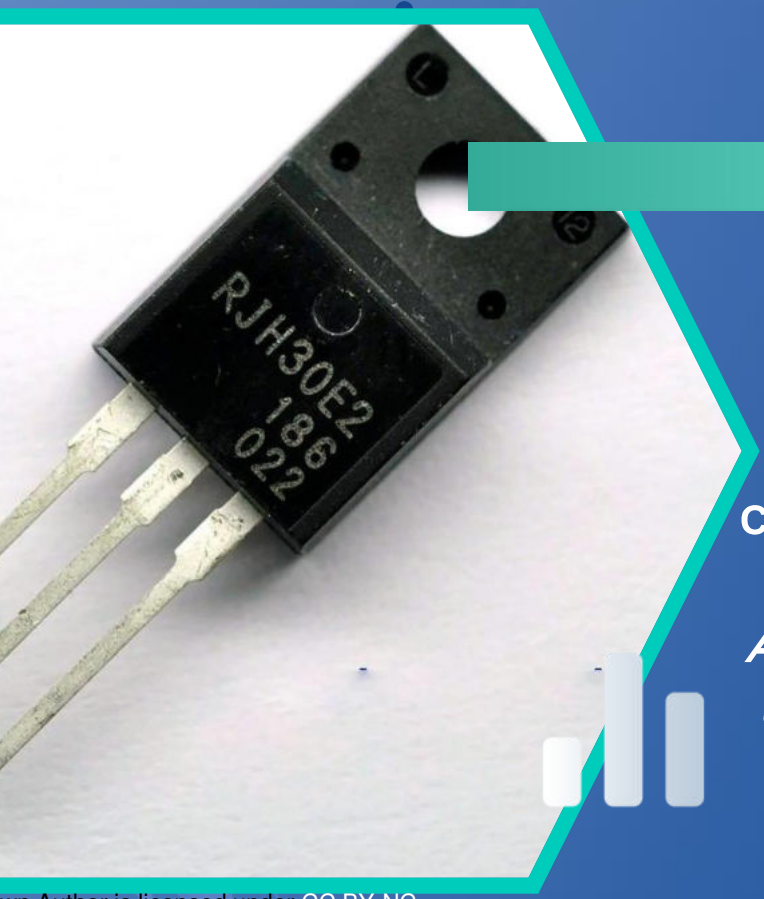
Unit	Description
Bit (Binary Digit)	A binary digit is logical 0 & 1
Nibble	1 Nibble = 4 bits
Byte (B)	1 Byte = 8 bits
Kilobyte (KB)	1 KB = 1024 B
Megabyte (MB)	1 MB = 1024 KB
Gigabyte (GB)	1 GB = 1024 MB
Terabyte (TB)	1 TB = 1024 GB
Petabyte (PB)	1 PB = 1024 TB
Exabyte (EB)	1 EB = 1024 PB
Zettabyte (ZB)	1 ZB = 1024 EB
Yottabyte (YB)	1 YB = 1024 ZB

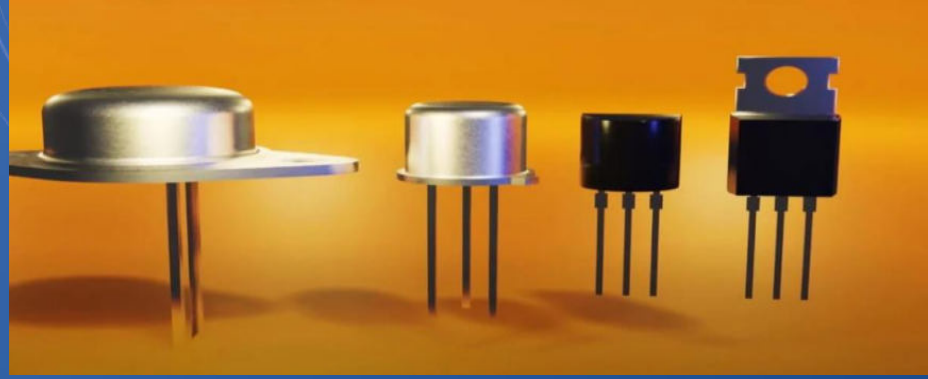




Microprocessor

As of June 2023, the microprocessor with the highest number of transistors is **Apple's M2 Ultra SoC**, which has **134 billion transistors**





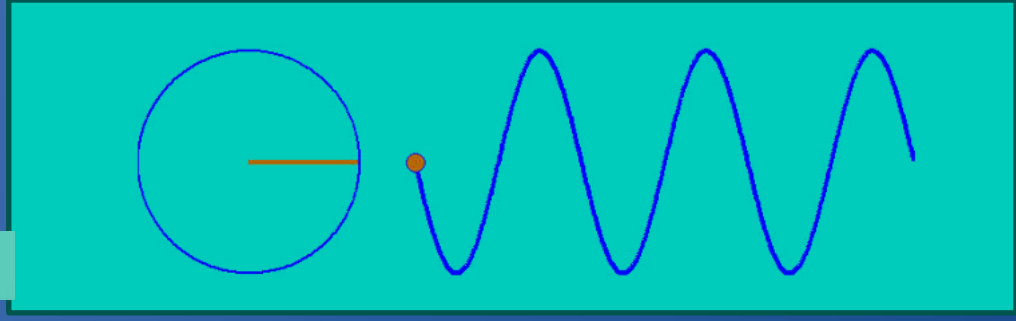
Transistor

Transistor is the smallest electronic component that can store or represent bit. It can be ON or OFF resulting 0 or 1

A transistor is a semiconductor device that controls or regulates the flow of electrical signals and power

Digital Vs Analog Signal

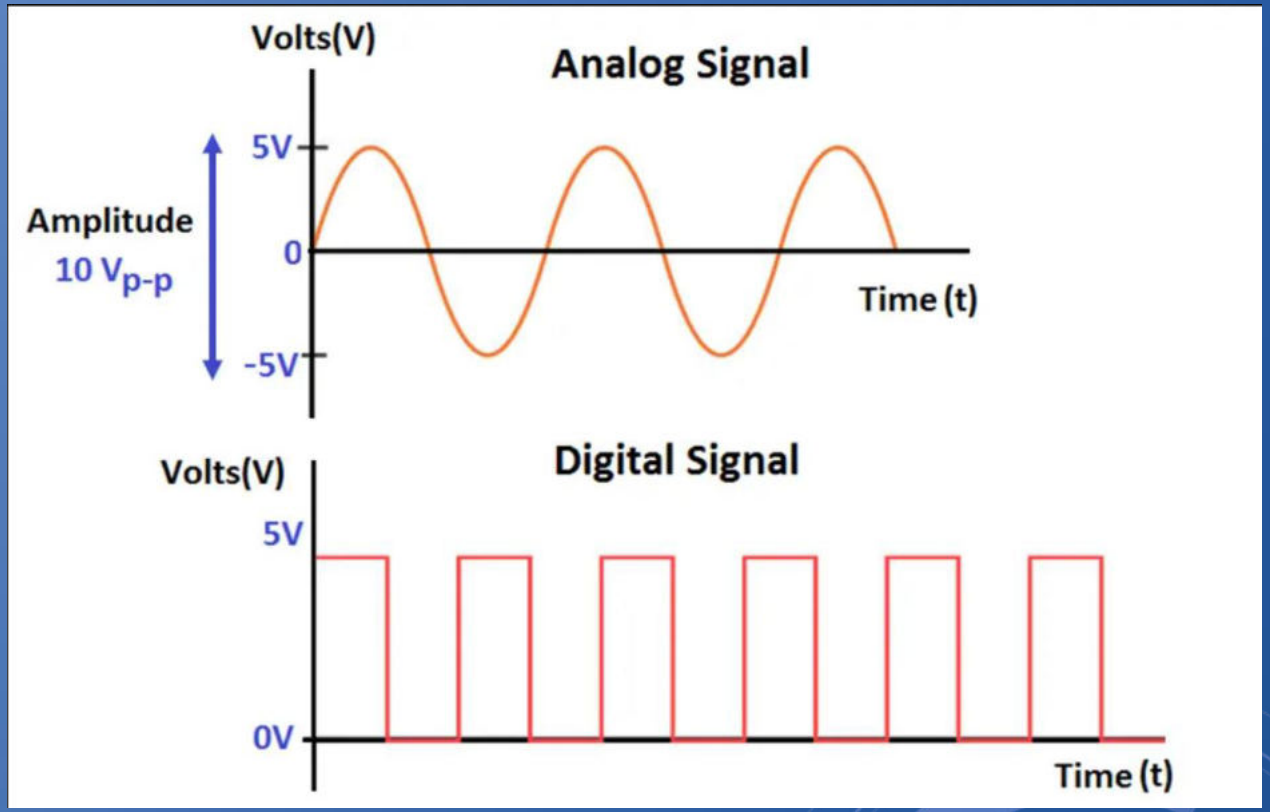
Digital and Analog Signal



Signal

A signal is a physical quantity that can **represent** and **convey information** and is passed between devices to **send and receive information**

Types of Signal



Analog
It carries data in analog form

Digital
It carries data in digital form

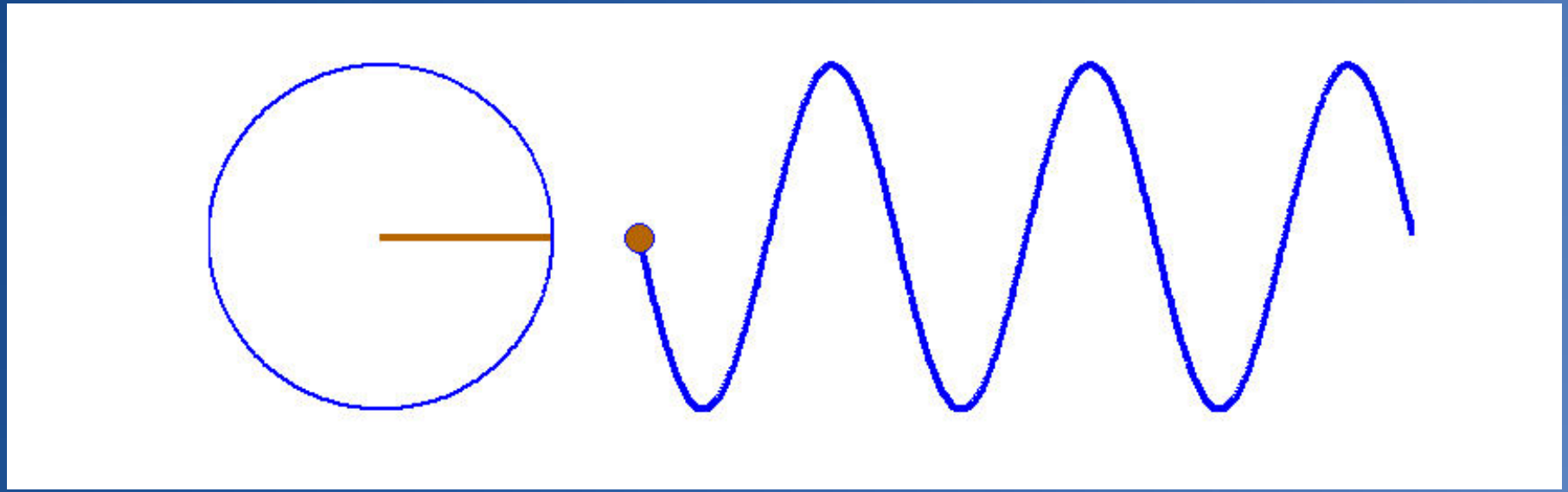
Analog Signal

Analog signal is continuous and can be represented in **sine waves** such as **human voice, music, television transmission signal** etc

An Analog signal is a physical quantity (Voltage, Current etc...) that **continuously varies under some time varying parameter**.

In analog signal the **amplitudes** and **frequency** may vary

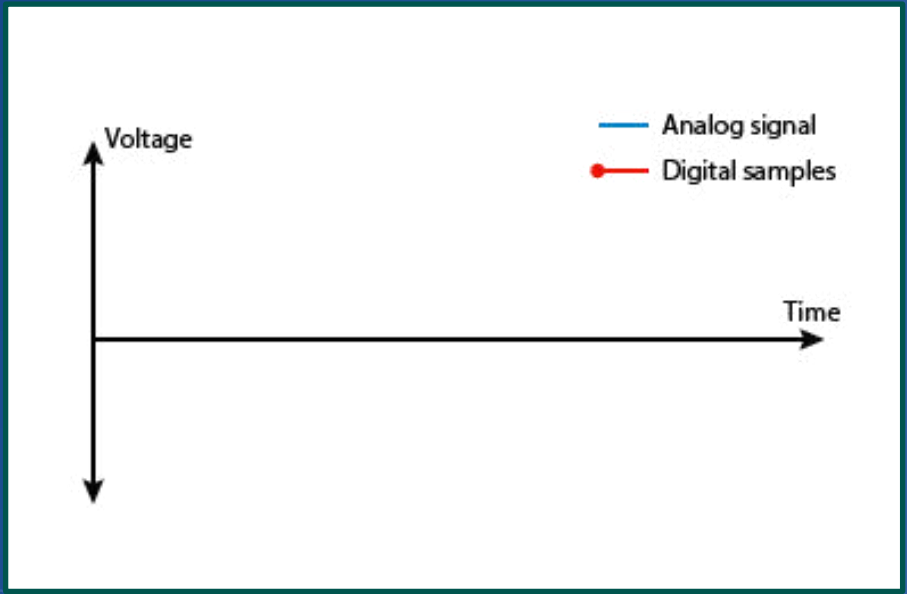
Analog Signal

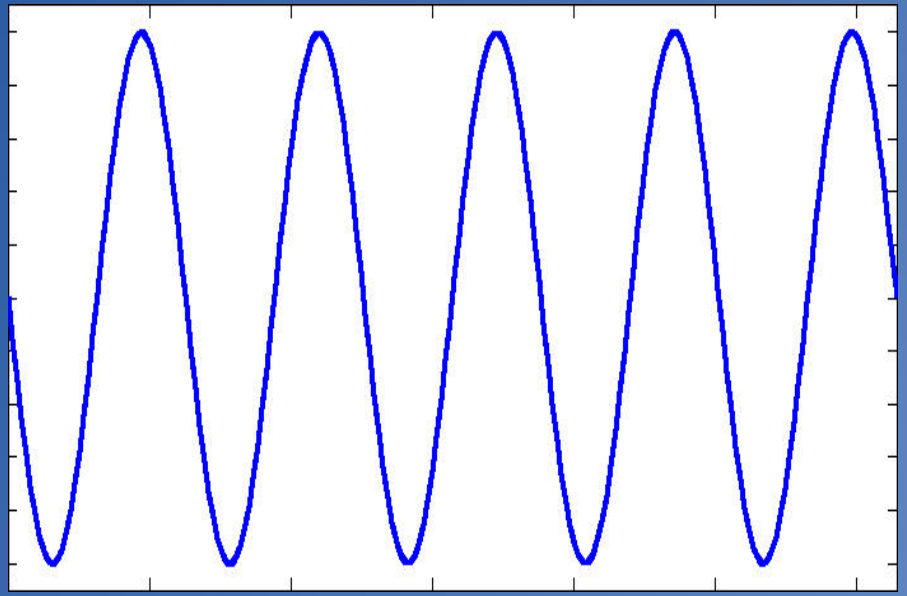


Digital Signal

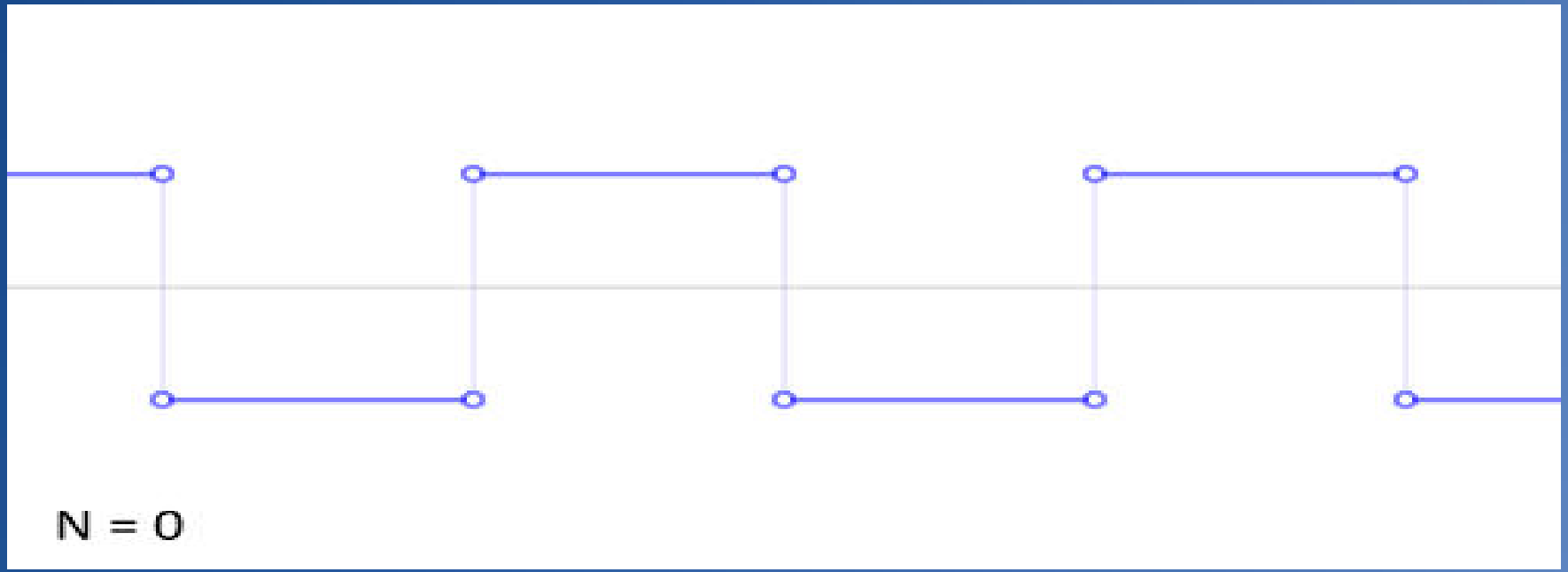
A digital signal is a physical signal that is a representation of a **sequence of discrete values**
It describes any system based on **discontinuous data or events**
Modern computers are **digital machines** because they can **distinguish between just two values in basic i.e. 0 (low) and 1 (high)**
Data transmission between computer peripherals and inner parts of computer is digital transmission

Digital Signal





Digital Signal



Digital

Communication

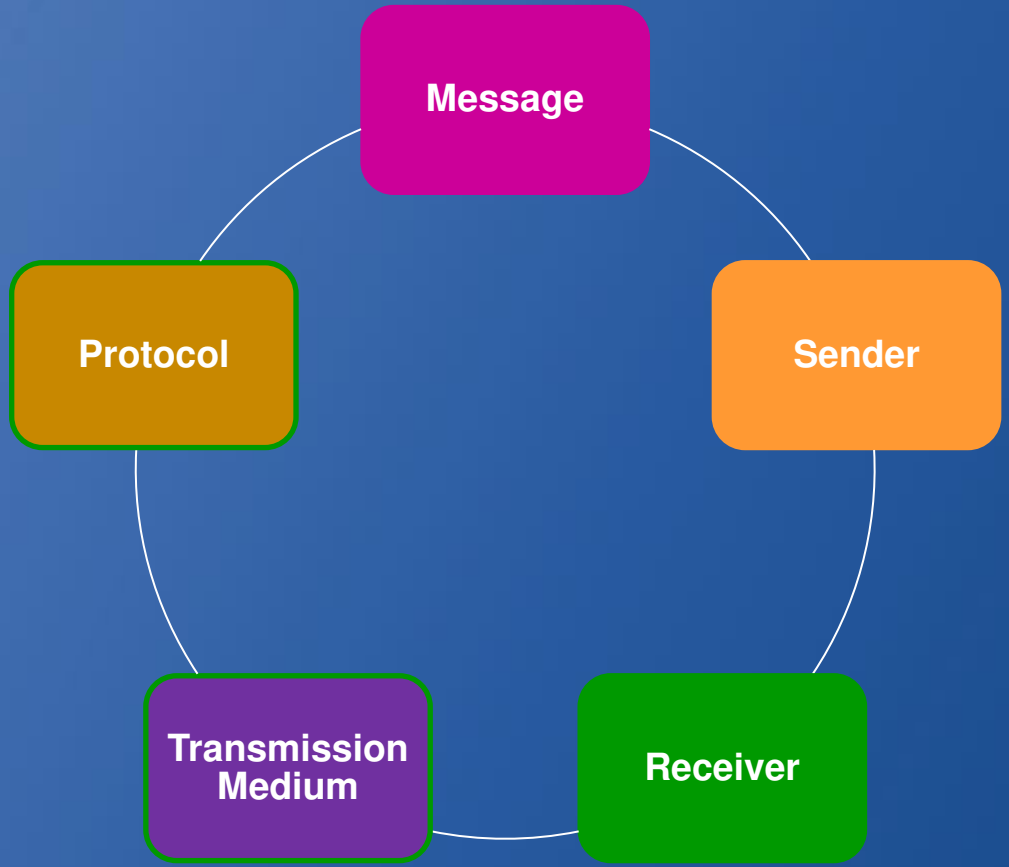
Communication System
Components of communication system
Elements of communication system

Communication System

Data communications are the **exchange of data between two devices through some form of transmission medium** such as wire cable or wireless medium

There are **5 basic elements of communication system**

Elements of communication system



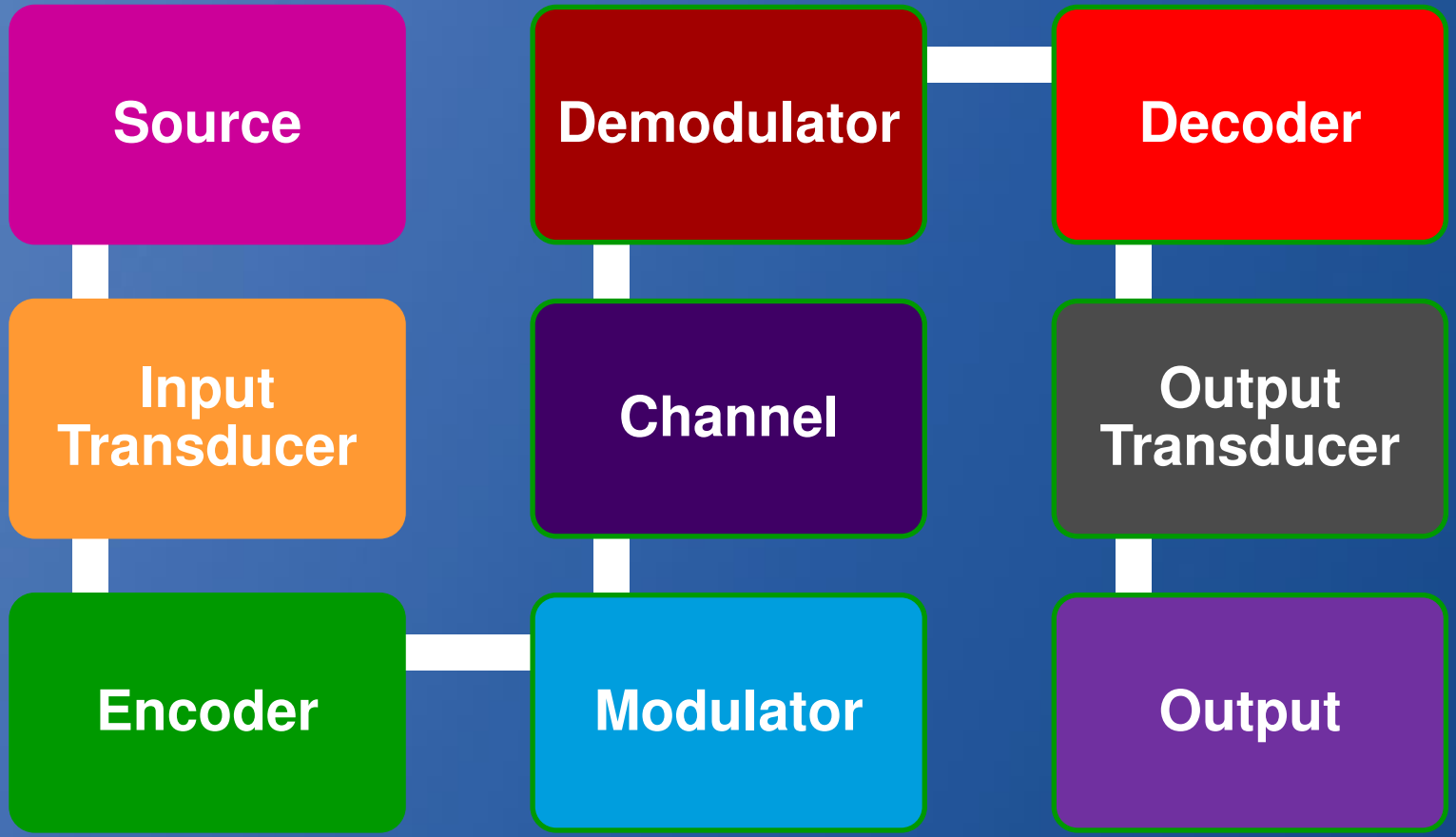
Elements of communication

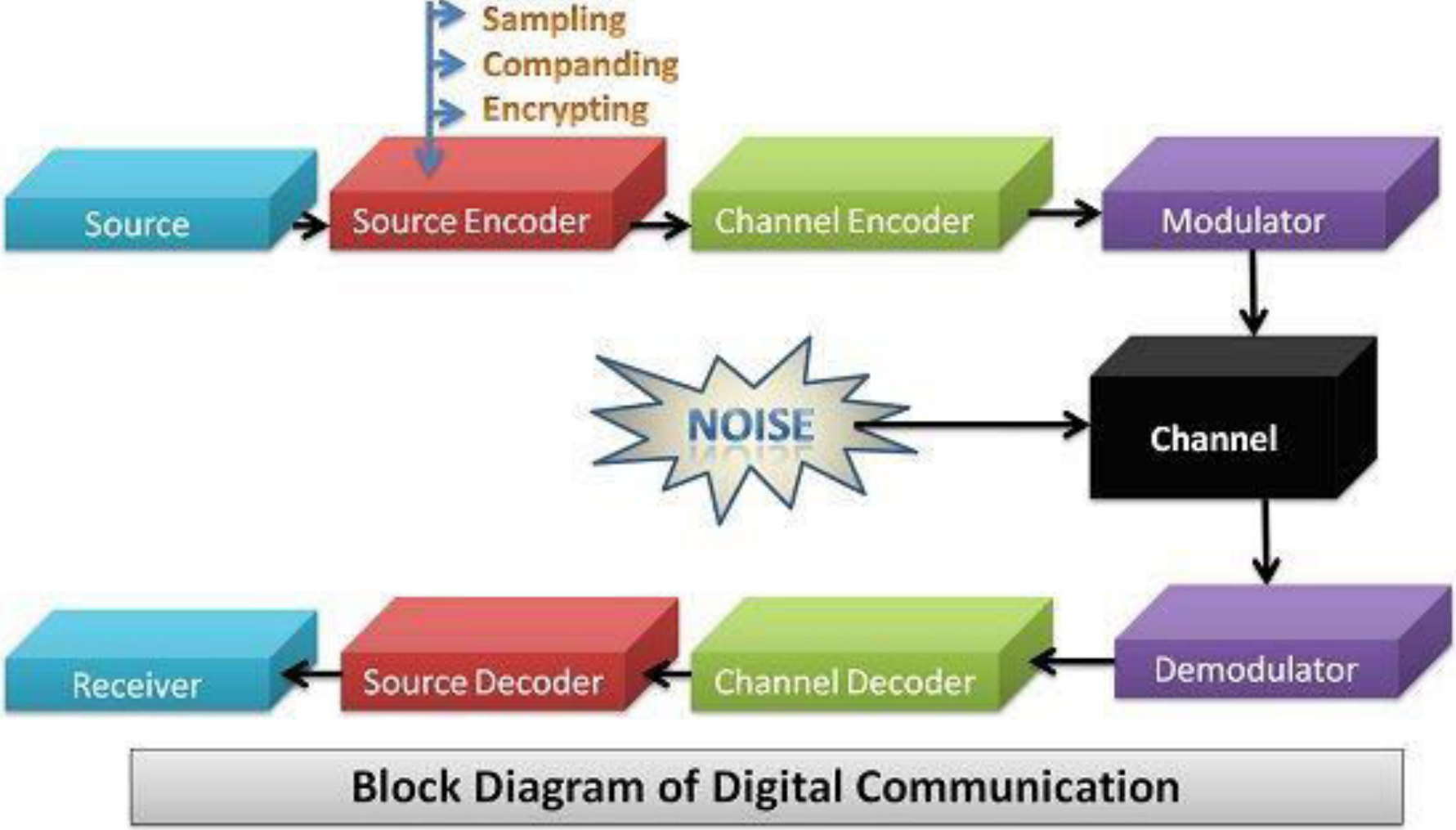
- **Message:**
  - The message is data or information to be communicated and it is the form of text, number, picture, audio and video.
- **Sender:**
  - The sender device sends the messages to the receiver and it can be computer, workstation or any networking devices.
- **Receiver:**
  - The receiver device receives the messages from the medium and it can be computer, workstation or any networking devices.

Elements of communication

- **Transmission medium:**
  - The transmission medium is physical connection in which a message can travel from sender to receiver and vice versa.
  - The medium can be wired and wireless.
- **Protocols:**
  - A protocol is a set of common rules that manages the data communications. Without protocol two devices can be connected but not be communicated but not be communicated. It represents an agreement among the different communication devices in a network.

Components of Digital Communication System





Block Diagram of Digital Communication

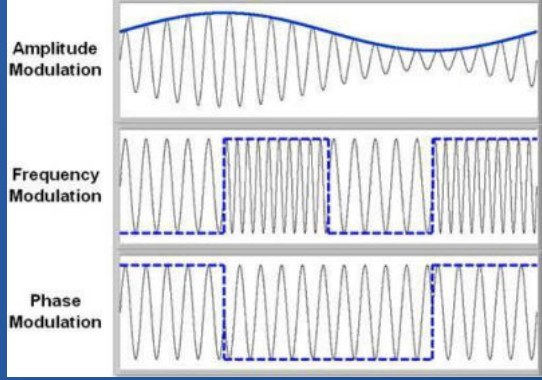
Components of communication

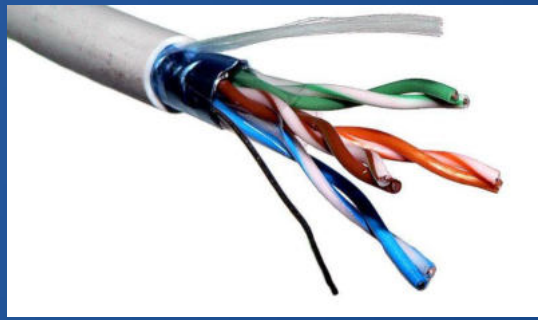
- **Source**
  - Analog signals like sound waves, visuals etc.
- **Input Transducer**
  - Converts received signals into an electrical signal
  - e.g. Microphone, camera etc.

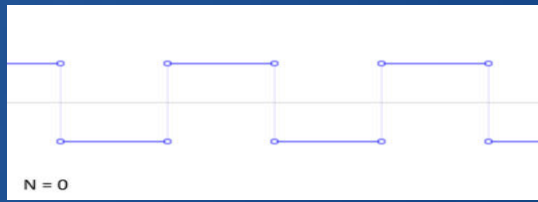
- **Encoder**
  - Compress data and represents in binary format
  - Utilizes the available bandwidth

Components of communication

- **Modulator**
  - Modulates the data to be transmitted
  - More energy, more travelling capacity
  - Converts digital message signal to analog signal
- **Channel/Transmission Media**
  - Medium through which data can be transmitted
  - e.g. coaxial cable, optical fiber, wi-fi, microwave etc.
- **Demodulator**
  - Extracts original message signal
  - Converts analog modulated signal to digital message signal







Components of communication

- **Decoder**
  - Extracts the meaning from encrypted message signal
  - Removes possible error
- **Output Transducer**
  - Converts decoded signals into physical signal output
  - Regenerates the original message signal
- **Output Signal/Message**
  - Result of the overall signal transmission process
  - Understood by human

Modulation & Demodulation

Amplitude Modulation (AM)
Frequency Modulation (FM)
Phase Modulation (PM)

Modulation

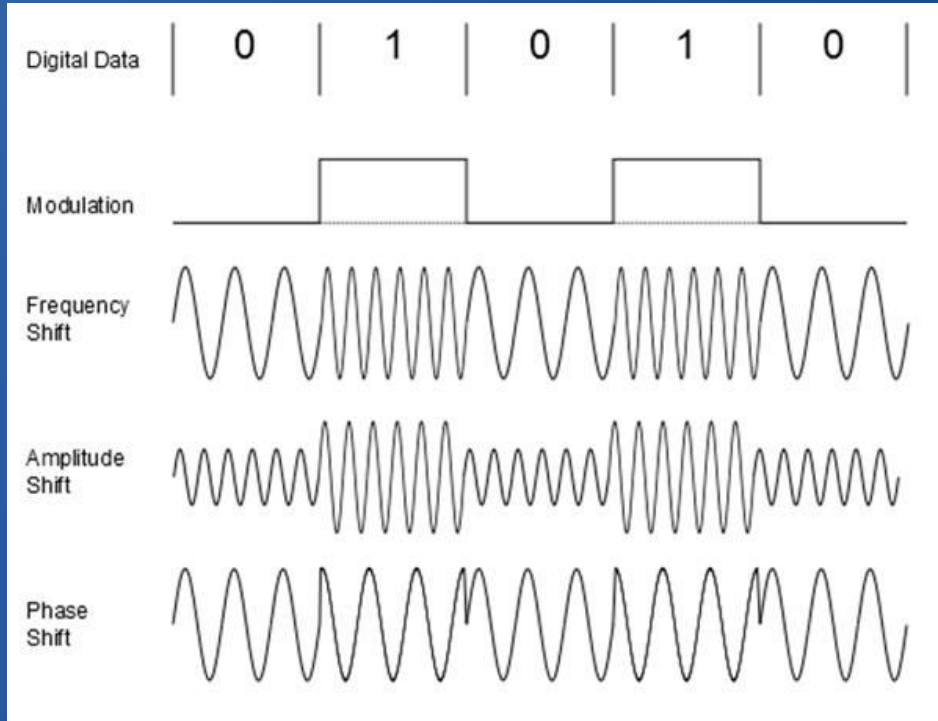
- Original message signal can't be transmitted over longer distance because
  - **message signal has low frequency**
  - **low frequency signal have low strength**
  - **weak signal can't travel for long distance**
  - **message signal is weak signal**

Modulation

- Modulation is the **process of changing or encoding the carrier wave in accordance to message signal**
- It is the **process of superimposing a message signal with a carrier signal** is called modulation.
- Some modulation technique change the height of the signal, some changes the timing and some changes phase of the signal

Modulation

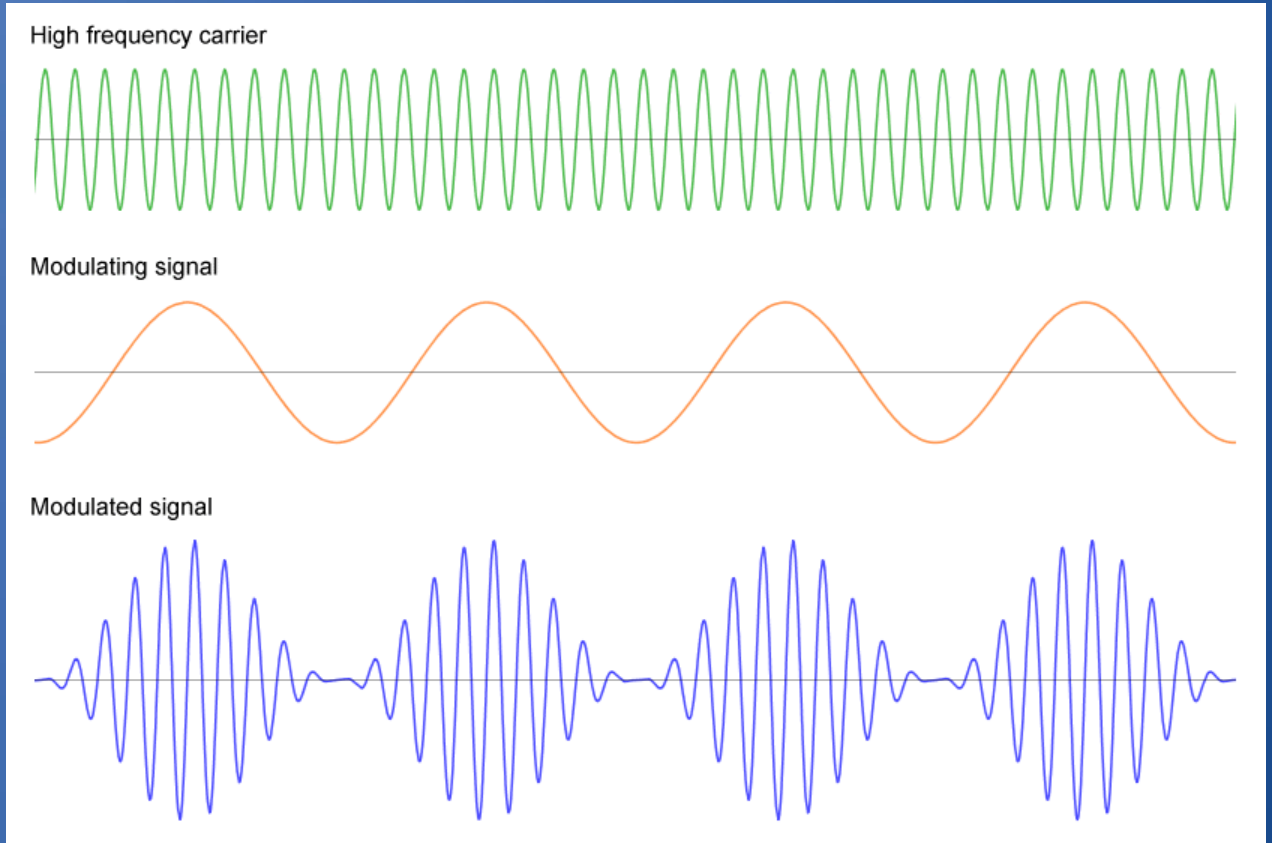
- There are 3 types of modulation
  - **Amplitude modulation (AM)**
  - **Frequency modulation (FM)**
  - **Phase modulation (PM)**



Amplitude Modulation

- The process of changing the **amplitude of carrier** signal in **accordance to message** signal.
- The other characteristics of carrier signal i.e. **phase** and **frequency** remains **unchanged** or constant
- AM transmission is not very good for high quality transmission
- E.g. Radio Nepal Broadcasts in 535 kHz & 729 kHz AM wave

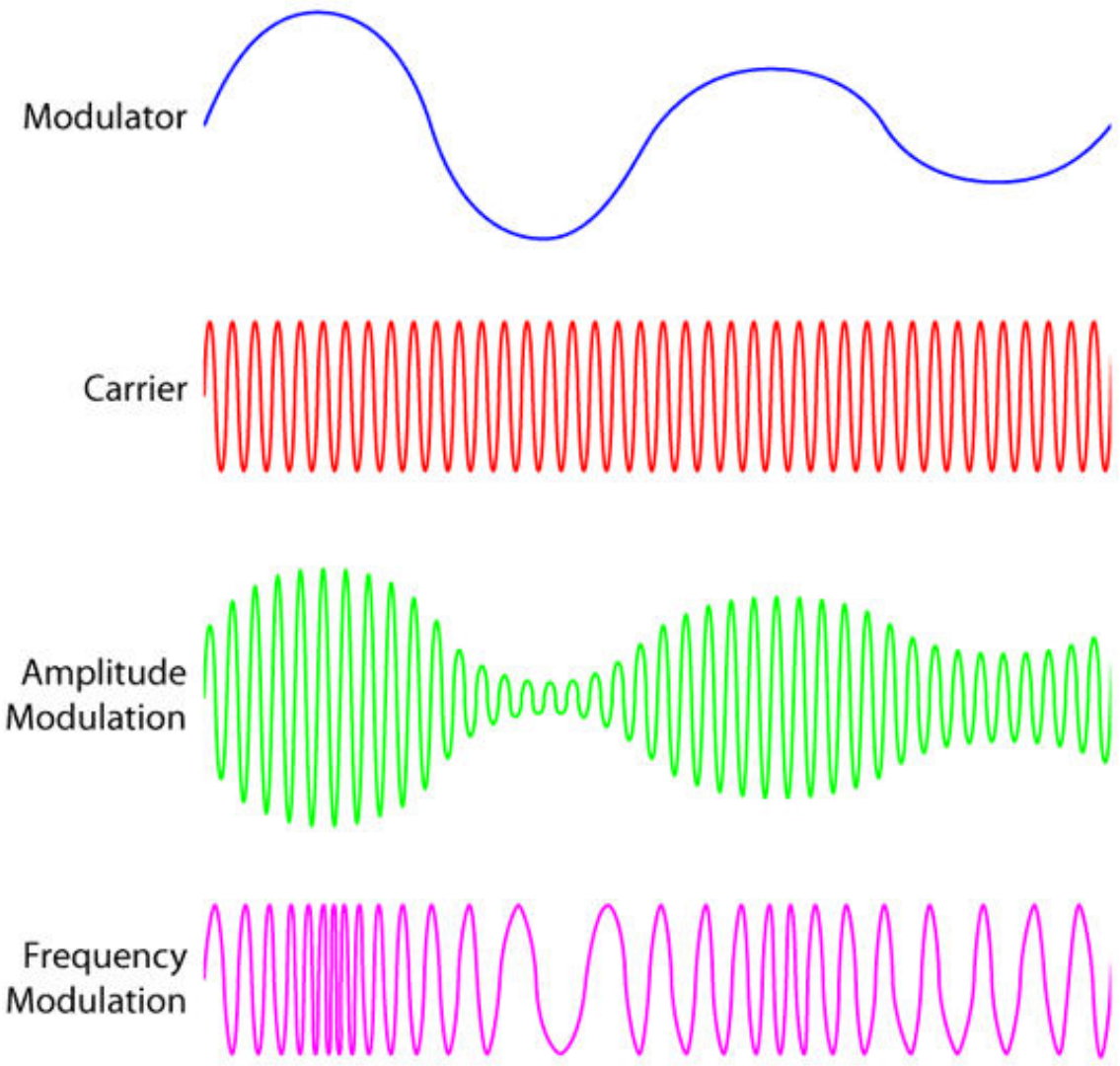
Amplitude Modulation



Frequency Modulation

- The process of changing the **frequency of carrier** signal in **accordance to message signal**.
- The other characteristics of carrier signal i.e. **phase** and **amplitude** remains **unchanged** or **constant**
- FM has less amount of noise and gives best encoding method as far as quality is concerned
- E.g. FM Radios stations broadcasts their signal in 88 MHz to 108 MHz frequency range

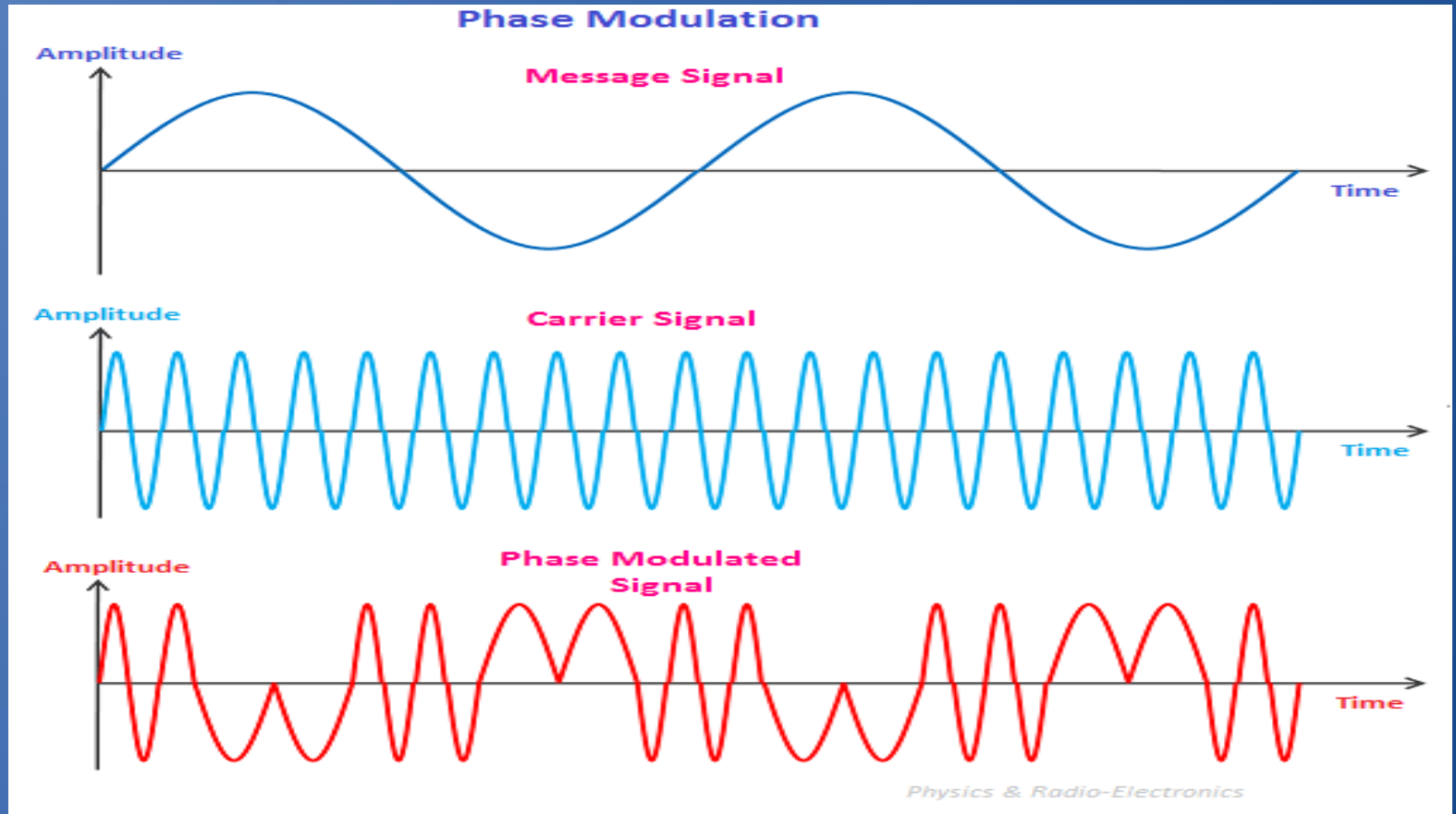
Frequency Modulation



Phase Modulation

- The process of changing the **phase of carrier** signal in **accordance to message** signal.
- The other characteristics of carrier signal i.e. **frequency** and **amplitude** remains **unchanged** or constant
- PM is also the basis for many forms of digital modulation based around phase shift keying (PSK)

Phase Modulation

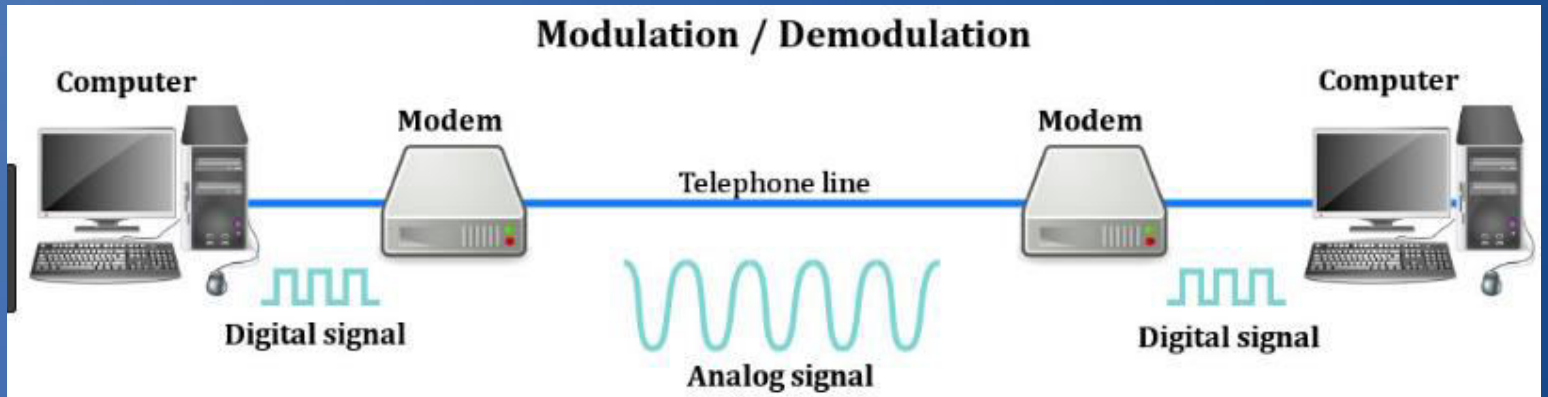


DE-modulation

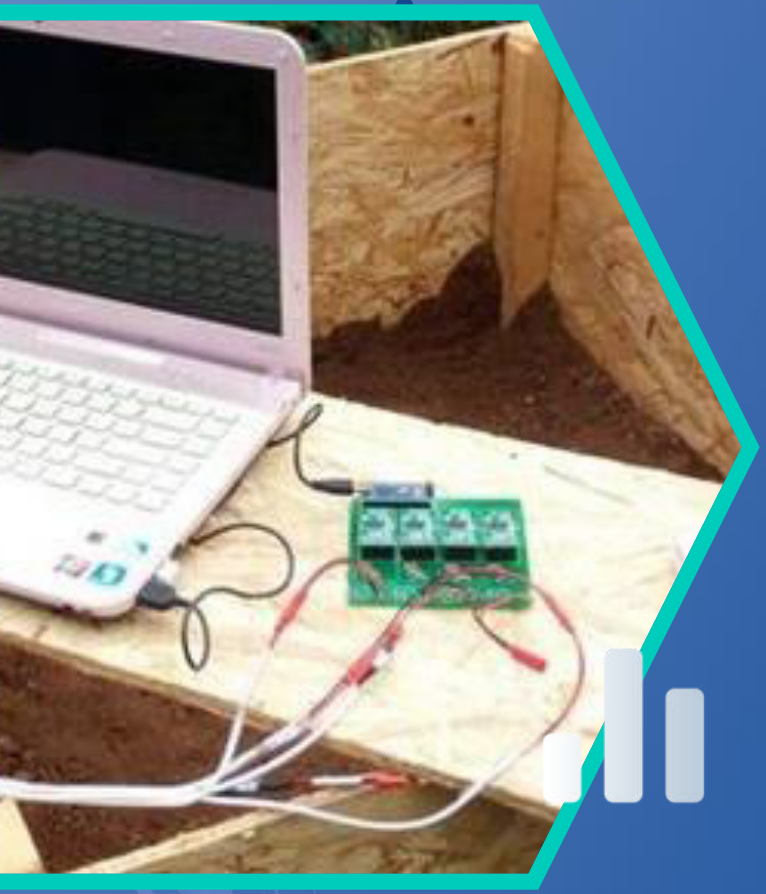
- Demodulation is the **process of regenerating the original message signal from the received modulated signal**
- It is the **reverse process of modulation**
- It is **done at the receiver end**
- The **device which modulates and demodulates** signal is called **modem** in computer

DE-modulation

- Conversion of **digital signal into analog signal** is called **modulation**
- and conversion of **analog signal to digital signal** is called **de-modulation**



Baseband Vs Broadband Transmission



Baseband

Baseband transmission means the **transmission of digital signals** through channels **without conversion from digital signal to analog signal**.

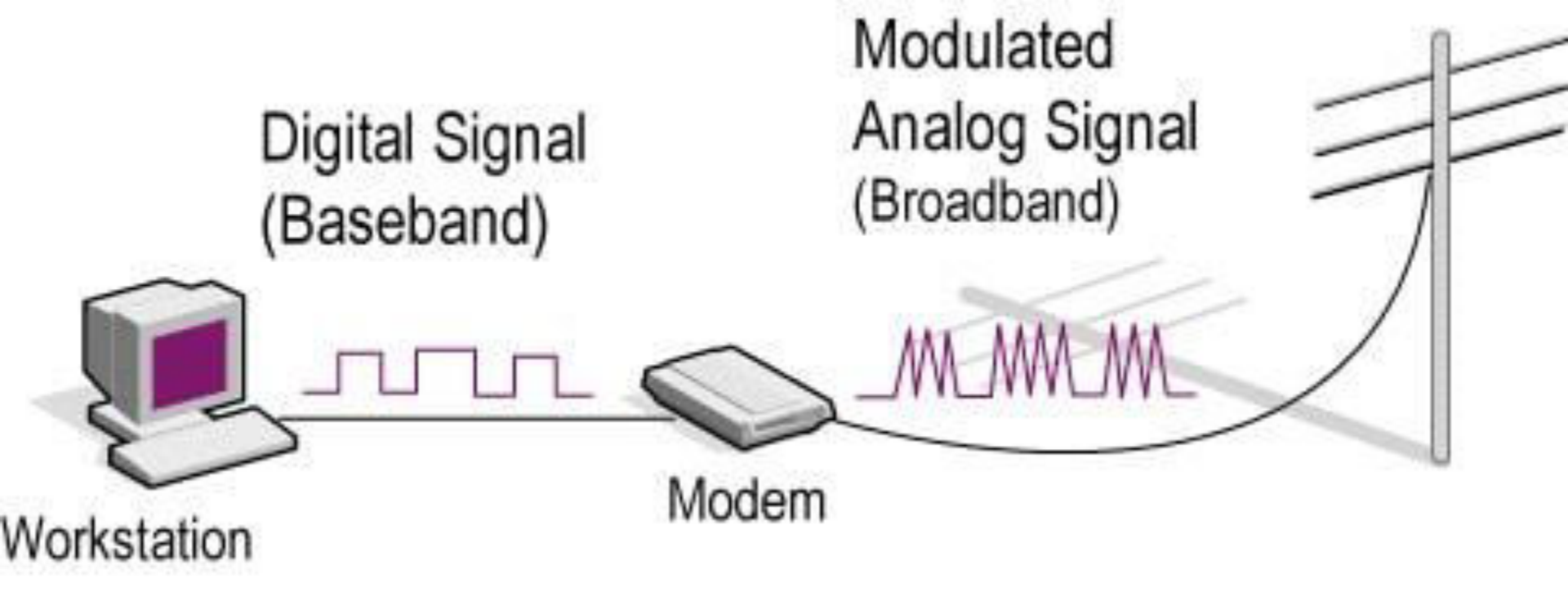
It is done for short distance transmission.

Like inside computer peripherals

Broadband

Broadband transmission means the **transmission of digital signals** through channels **with conversion from digital signal to analog signal**. It requires **modulation**. The channel gets divided into two channels: for **incoming** & **outgoing**. It is used for long distance transmission

Baseband VS Broadband



Advantages of digital transmission

- Less noise or noise removal can be done
- Much more reliable communication
- Less possibility of signal overlap and cross-talk
- Security can be obtained using encoding & decoding
- Less chance for error in communication

Question Of The Day

What changes did you find after you learned to use ICT ?

Positive & Negative Impacts of Digital Technology

Impact of Digital Technology

- **Digital telecommunication**
  - Fast & reliable communication
  - Multiple telephone lines in single channel (Multiplexing)
  - Data privacy & Beller engagement
  - Automation

Impact of Digital Technology

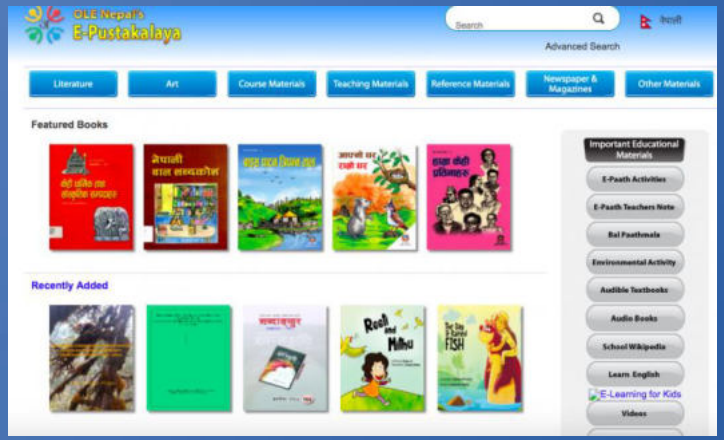
- **Digital Media**
  - Creating new digital media, editing, publishing images/audio/videos etc.
  - Watching online news, ads, music, video etc.
  - Electronic devices has been widely used in this field.

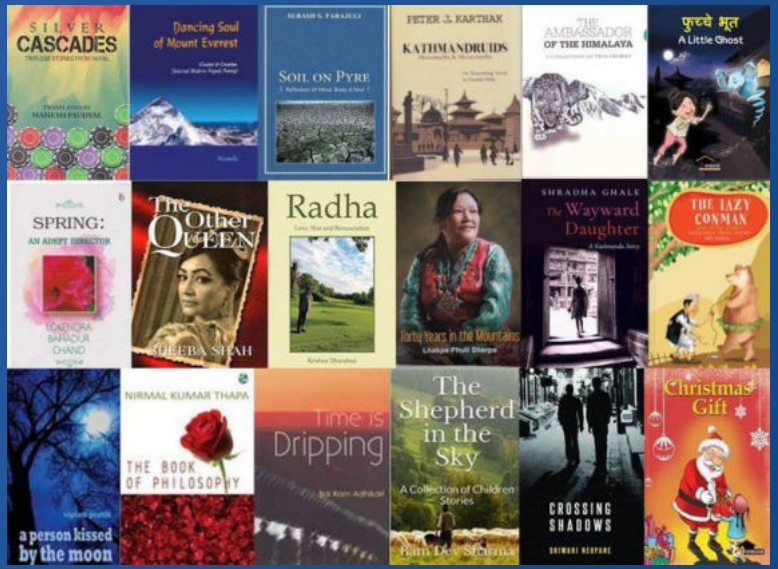
Impact of Digital Technology

- **Digital TV**
  - TV service has been transformed from terrestrial(Antenna) to IPTV(Setup Box)
  - Content Creation, Live Broadcasting, Satellite Communication TV

Application of digital technologies

- **Digital Library/e-library**
  - Nepal National Library (www.nnl.gov.np)
  - Sajha Sikshya e-pati (www.olenepal.org)
  - E-Pustakalaya (www.pustakalaya.org)



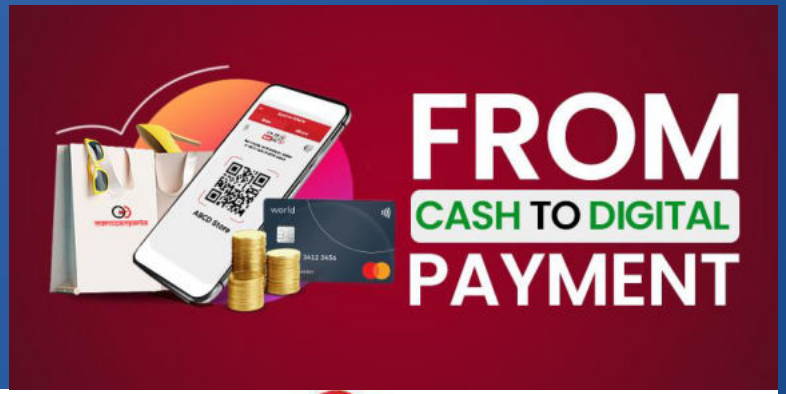


Application of digital technologies

- **Online Newspaper/media**
  - Online Majdoor (www.onlinemajdoor.com)
  - News Update Bhaktapur (www.newsupdatebhaktapur.com)
  - Janasanchar News (www.janasancharnews.com)

Application of digital technologies

- **Digital Payment**
  - Easy, fast & secure payment
  - No need to carry cash or money



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Application of digital technologies

- **Online Business**
  - Zero Inventory Business
  - Shop from home
  - Secure & Safe shopping

Application of digital technologies

- **Social Media**
  - Connected to all people from all over world
  - Public opinion, views & Blogs
  - Virtual world

Application of digital technologies

- **Entertainment**
  - Games, videos, movies, animation,
  - VFX,
  - Virtual Reality,
  - etc.

Question Of The Day

What are the threats raised by ICT ?

Negative Impacts of Digital Technology

- Spend more time online, less social behavior
- Increase in digital crime or cybercrime
- Loss of business and job opportunities
- Lack of physical exercise results obesity & weakness
- Disturbs mental health & social well beings
- Misuse of digital technology
- many more...

Digital Citizenship & Digital Wellbeing

Definition
Characteristics of Digital Citizen
Online reputation
Digital wellbeing

Question Of The Day

How many of you have used your own photo, original name in your facebook profile ?

Digital Citizen & Citizenship

A person who actively uses and engages in the internet is known as Netizen (citizen of internet)

Digital Citizenship is the citizenship of the netizen in the virtual world of the internet

Characteristics of Good Netizen

Behavior should be socially acceptable

Should use polite & civilized languages

Self respect & respect for others

Respect intellectual property right

Online Reputation

Real name, photo, identity & other information in online profile

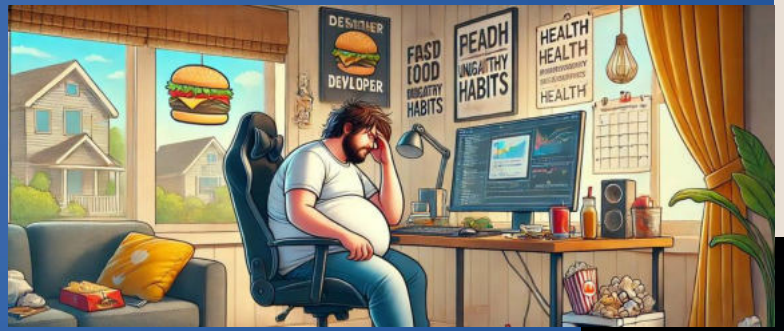
Posts, comments, likes, shares should be credible & authentic

Right of privacy

Reputation is not only personal but also associated with an organization

Digital Wellbeing

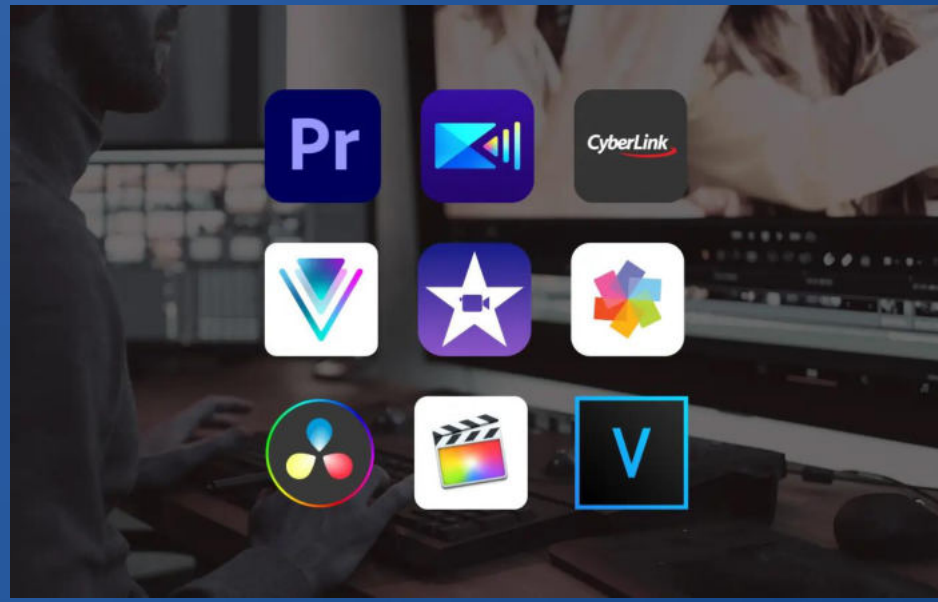
- Staying online for long time without maintaining physical balance may harm our health issues like
  - obesity
  - insomnia
  - vision problem
  - mental stress
  - depression
  - anxiety
  - dishonesty
  - social isolation
  - loneliness
  - aggressiveness

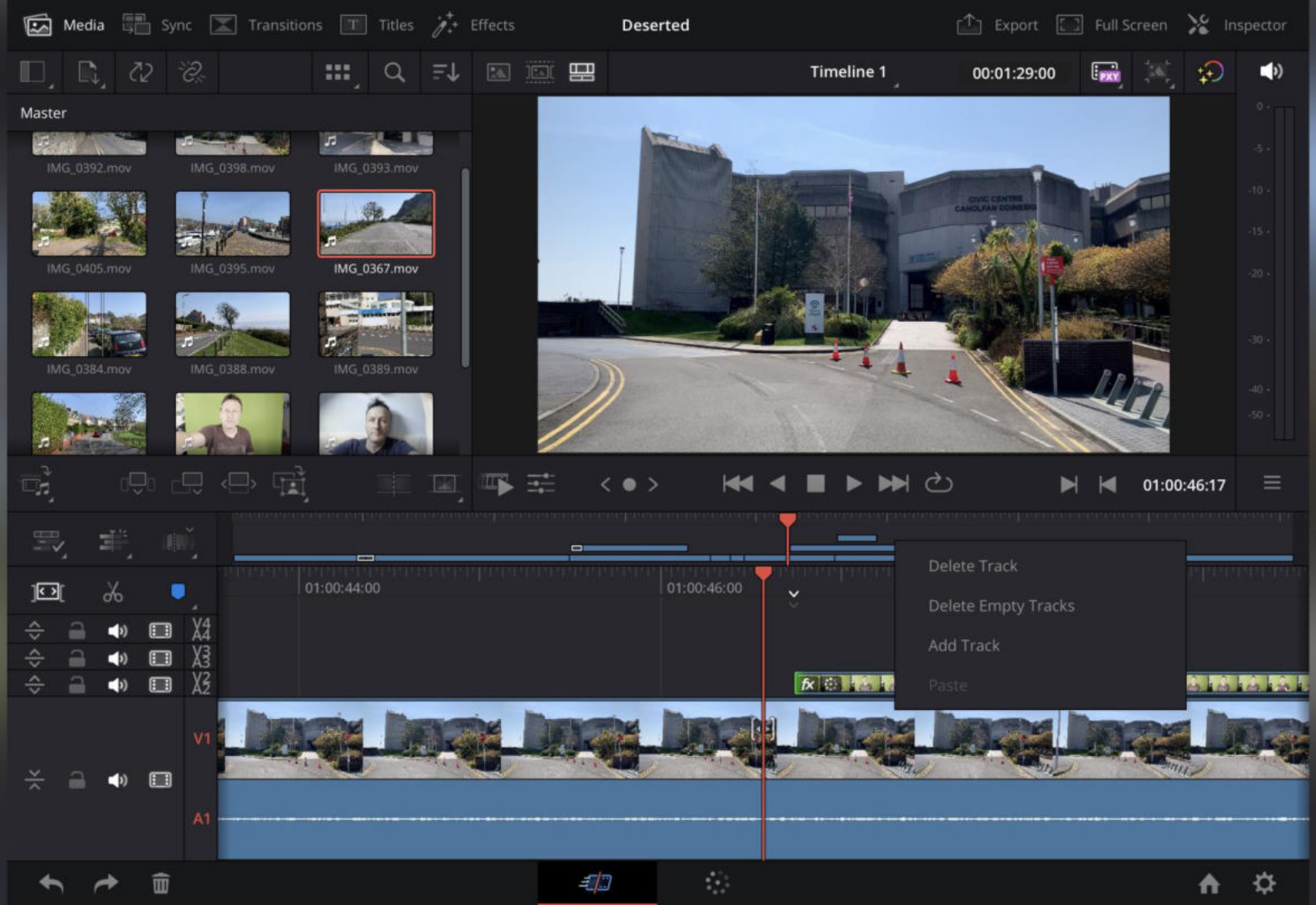


Audio Video Editing

Video Editing

- Video editing can be done using various mobile apps or computer software like
  - capcut
  - Adobe Premiere Pro
  - Wondershare Filmora
  - Nero Vision
  - Movie maker etc

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Full Screen
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Timeline 1
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IMG_0389.mov
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01:00:44:00
01:00:46:00
Delete Track
Delete Empty Tracks
Add Track
Paste
V1
A1

Thank you