

## EE303 Lesson 1: Introduction

### Communications

The purpose of a communications system is to transmit \_\_\_\_\_ over a distance.

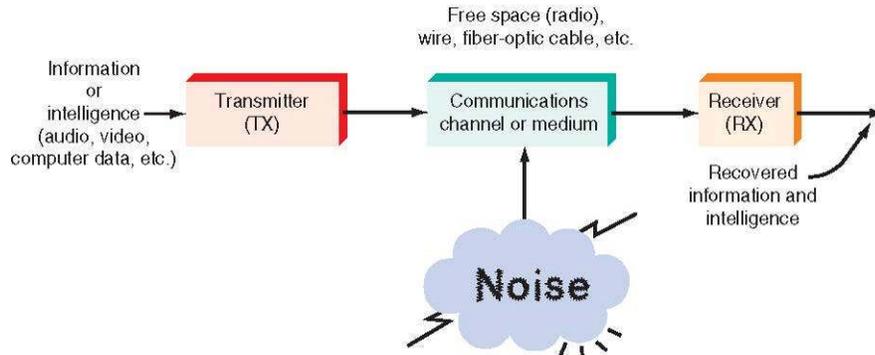
Information can take numerous forms

- Audio – speech, music
- Video
- Sensor data – temperature, pressure, etc.
- Data – digital information

### Communication systems

The fundamental components of all electronic communication systems are the

1. \_\_\_\_\_
2. Communications \_\_\_\_\_ (or medium)
3. \_\_\_\_\_



### Transmitter

The purpose of the transmitter is to convert information into an electronic form suitable for the given communications channel.

Conversion of a physical signal into an electrical signal is handled by a \_\_\_\_\_.

Transmitters use oscillators, amplifiers, filters, modulators and mixers to convert the input electrical signal into a format compatible with the transmission medium.

### Communications channel

The communications channel is the physical medium through which an electronic signal travels. Many different types of media are used in communications channels.

#### Electrical conductors

Electrical conductors or wires were the first and simplest transmission medium.

Examples include \_\_\_\_\_ cable, copper phone lines, and twisted-pair Ethernet cables.

#### Optical media

Fiber optic cables information embedded in pulses of light produced by lasers.

### Free space

When electromagnetic radiation is transmitted across air (or a vacuum) between transmitter and receiver that are not physically connected, it is called transmission via free space.

Examples include wireless or \_\_\_\_\_ transmission.

### Noise

Noise refers to the corruption of the original information signal.

Noise is one of the fundamental limiting factors on all communications systems.

### Receivers

The receiver refers to the electrical circuitry that converts the transmitted signal back into a useable form.

Two-way equipment commonly incorporates both transmitter and receiver functions and are known as \_\_\_\_\_.

### Types of electronic communications

Communications systems fall under broad classifications.

\_\_\_\_\_ communication is referred to as \_\_\_\_\_ communication.

Example include broadcast TV, radio, or pagers.

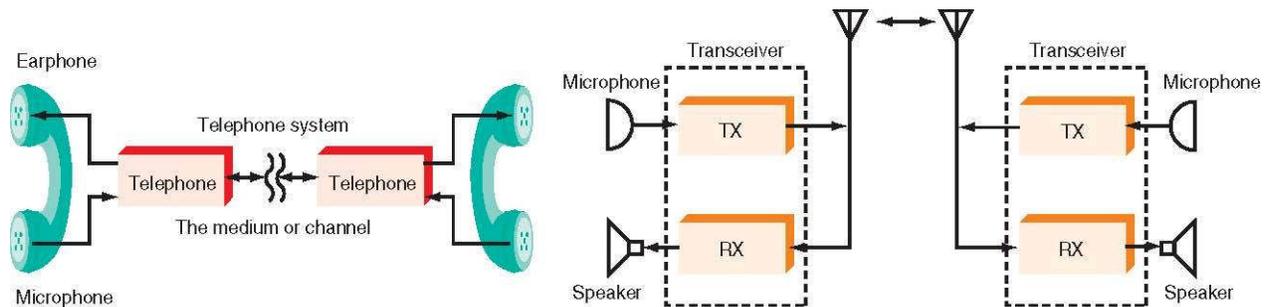


### Duplex

Two-way communication is called \_\_\_\_\_.

Simultaneous two-way communication is referred to as full-duplex.

When only one party at a time can transmit, it is called half-duplex. (CB radio, air traffic control)

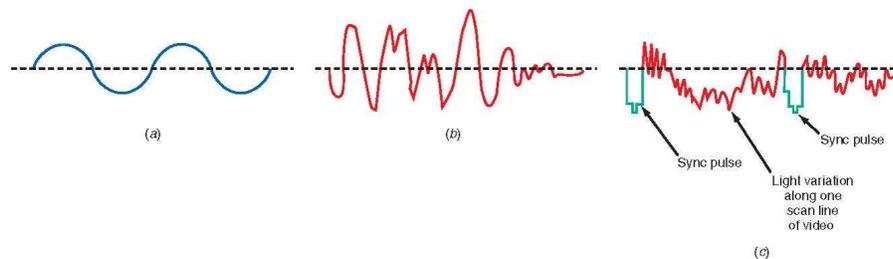


\_\_\_\_\_ - duplex

\_\_\_\_\_ - duplex

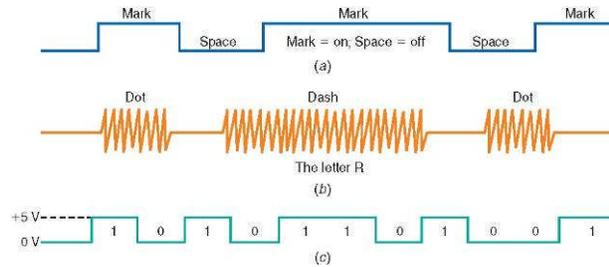
### Analog signals

An analog signal is a continuously varying such as in voice or music.



## Digital signals

Digital signals change in discrete increments and represent digital (binary) information such as is used by computers.



## Electromagnetic spectrum

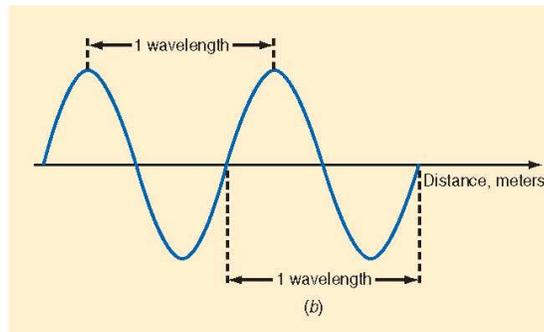
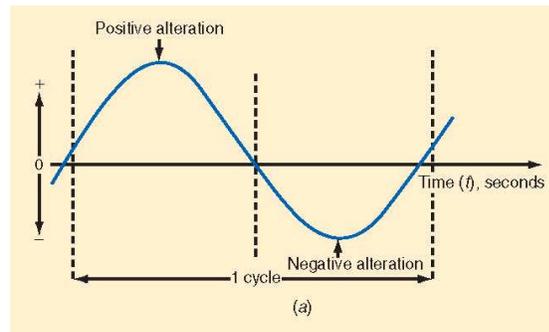
Electromagnetic radiation propagates in \_\_\_\_\_.

The entire range of frequencies of these electromagnetic waves is known as the electromagnetic \_\_\_\_\_.

## Frequency and wavelength

\_\_\_\_\_ ( $f$ ) is the number of cycles per second of a wave measured in hertz (Hz).

\_\_\_\_\_ ( $\lambda$ ) is the distance traveled by one cycle of a wave measure in meters.



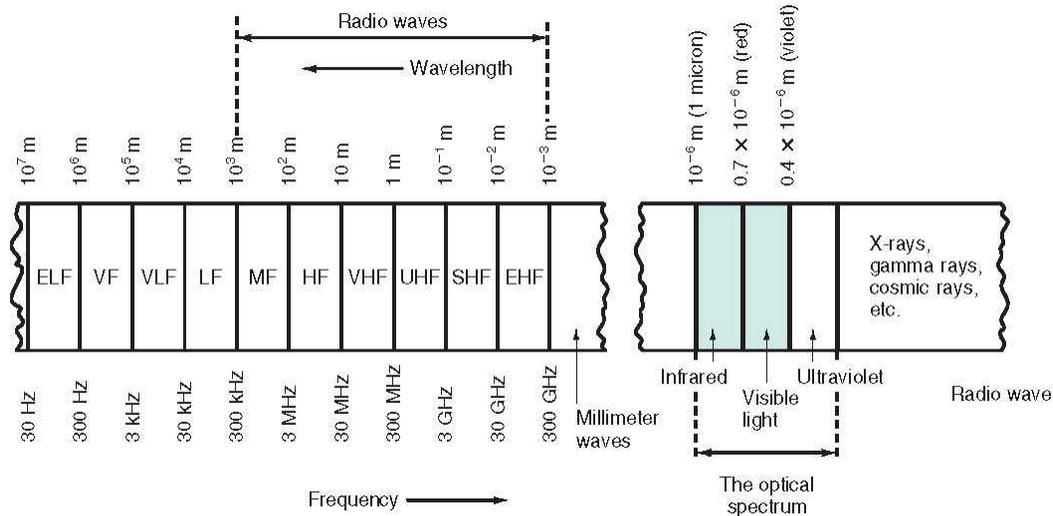
## Speed of light

Recall that the speed of wave propagation is given by  $c =$

For electromagnetic waves traveling in air (or vacuum),  $c$  is roughly \_\_\_\_\_ m/s.

## Frequency ranges

The electromagnetic spectrum is divided up by frequency ranges.



Extreme low frequency (\_\_\_\_) 30 to 300 Hz.

Voice frequency (\_\_\_\_) 300 to 3000 Hz. Normal range of human \_\_\_\_\_.

Very low frequency (\_\_\_\_) 3 to 30 kHz. Used for communications with submerged submarines.

Low frequency (\_\_\_\_) 30 to 300 kHz. Long range radio navigation.

Medium frequency (\_\_\_\_) 300 to 3000 kHz. Long range communication.

High frequency (\_\_\_\_) 3 to 30 MHz. Known as “\_\_\_\_\_” used two-way radio.

Very high frequency (\_\_\_\_) 30 to 300 MHz. Radio communications and FM radio.

Ultra high frequency (\_\_\_\_) 300 to 3000 MHz. TV, military and cell phones.

Super high frequency (\_\_\_\_) 3 to 30 GHz. Microwave. \_\_\_\_\_ communications and radar.

## Example Problem 1

What is the wavelength of an FM radio station whose frequency is 101.1 MHz?