

**TECH 3812**  
**Advanced Electronic Communication**

**Lecture 1**

**Communication and Telecommunication Systems**

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**Objectives**

- Know what a communication system is
- Know how to represent a generic communication system in block diagram form
- Know the different transmission media
- Know the different transmission modes
- Develop a sense of the evolution of modern telecommunication

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**Communication System**

- **Communication System:** a system that transfers information from one location to another.

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graph LR; A[Information to be transmitted] --> B[Transmitter]; B --> C[Transmission Medium]; C --> D[Receiver]; D --> E[Destination of Information];
```

Simple Block Diagram

- **Telecommunication System:** a system that transfers information over a long distance – today, usually via electromagnetic waves.

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## Transmission Medium

- Transmission medium links the transmitter and receiver (It is the channel through which data is sent from one place to another)
  - Free space
  - Coax cable
  - Optical fiber
  - Telephone line
- Transmission medium depends on several factors
  - How much bandwidth is required
  - Security
  - Cost
  - Distance

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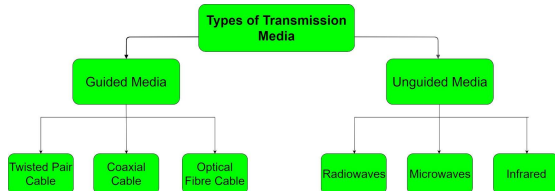
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## Transmission Media

- Two types of transmission media
  - Guided (i.e., wired)
  - Unguided (i.e., wireless)



<https://www.geeksforgeeks.org/types-transmission-media/>

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## Transmission Modes

- Simplex (SX) – Transmission can only occur in one direction
  - The simplest transmission mode
  - Example: Commercial radio and television. Radio and TV stations always transmit & you only receive
- Half Duplex (HDX) – Transmission can occur in both directions, but not at the same time. Each location may be a transmitter & receiver, but not at the same time
  - Many two-way radio systems use push-to-talk (PTT) buttons to key their transmitters on
  - Examples: Citizens Band (CB) radio; Police Band radio; Walkie-Talkies

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## Transmission Modes...

- Full Duplex (FDX) – Transmission can occur in both directions at the same time. A location can transmit and receive at the same time; the key is that the station it is transmitting to must also be the station it is receiving from.
  - Example: a standard (old) telephone system
- Full/Full Duplex (F/FDX) – Transmission and reception can occur simultaneously and not necessarily between the same two locations.
  - Example: U.S. Postal Service & Three-way telephone service

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## Historical Review of Modern Telecommunications

- 1820 First experiment of electric current causing magnetism
- 1831 Discovery that electromagnetic radiation induces current
- 1830–32 Birth of the telegraph
- 1837 Invention of Morse code
- 1864 Theory of electromagnetic waves developed
- 1876 Invention of the telephone
- 1887 Detection of electromagnetic waves
- 1896 Wireless telegraphy (radio telegraphy) patented
- 1901 First transatlantic radio telegraph transmission
- 1906 First amplitude modulation (AM) radio broadcasting
- 1925 First television system demonstration

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## Historical Review of Modern Telecommunications...

- 1935 First frequency modulation (FM) radio demonstration
- 1947 Cellular concept first proposed
- 1962 First computer telephone modem developed
- 1971 First wireless computer network
- 1973 First portable cellular telephone demonstrated
- 1984 First handheld (analog) AMPS cellular phone service
- 1991 First (digital) GSM cellular service launched
  - First wireless local area network developed
- 1996 First commercial CDMA (IS-95) cellular service launched
- 1997 IEEE 802.11 frequency hopping wireless LAN standard
- 1999 IEEE 802.11a and 802.11b wireless LAN standard

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## Historical Review of Modern Telecommunications...

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1999 Bluetooth 1.0 Specification

2000 First 3G cellular service launched

2008 4G-LTE cellular standard published by 3GPP in Release 8

B.P. Lathi and Z. Ding, *Modern Digital and Analog Communication Systems*, 5<sup>th</sup> ed., Oxford University Press, New York, 2019.

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