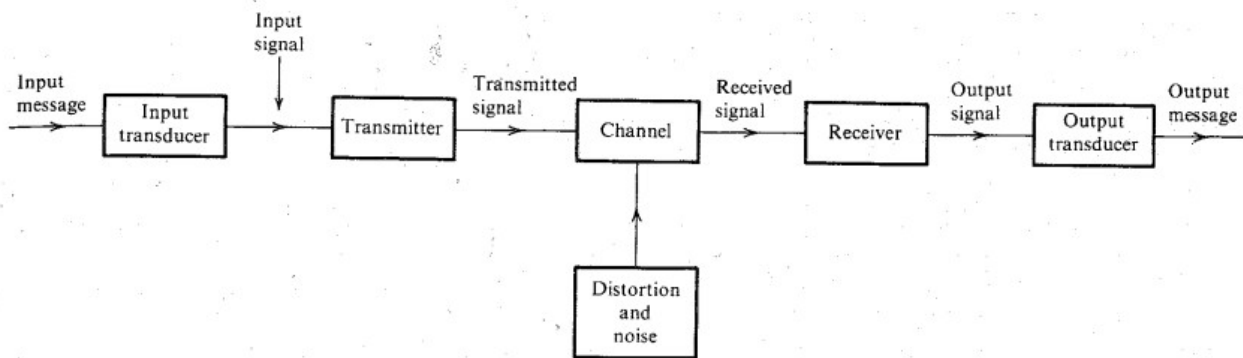


Modern Analog and Digital Communication Systems

Introduction (Motivation)

Basic Block Diagram of a Communication System:



Input Message : Low Frequency Signal in the non-electrical form.

Input Signal : Low Frequency Signal in electrical form / Baseband Signal / Message Signal / Modulating Signal.

Transmitted Signal: High Frequency Modulated Signal (A form suitable for transmitting the signal over large distances).

The Study of Communication Systems has two components to it:

1. Study of Various types of communication system.
2. Determination of the performance of a communication system in presence of noise.

Study of each of the above components of the topic requires us to have some understanding of a few mathematical tools we are going to use along the way.

1. 1st Comp → **Signal Analysis** using **Fourier Techniques**.
2. 2nd Comp → Basic Knowledge of **Probability** and **Random Processes**.

SNR (Signal to Noise Ratio)

SNR is defined as the ratio of the Signal Power P_{Sig} to the Noise Power P_{Noise} .

$$SNR = \frac{P_{Sig}}{P_{Noise}}$$

Defining **Modulation**:

The process of **altering any one** of the **characteristics** of a **Carrier** signal **with respect to** the characteristics of the **Baseband / Message** signal, is referred to as **Modulation**.

Depending on **which Character of the Carrier Signal is modified**, Modulation is of 3 types:

1. Amplitude Modulation (AM).
2. Frequency Modulation (FM).
3. Phase Modulation (PM).

Amplitude Modulation:

Amplitude Modulation is defined as the process in which the **Amplitude of the Carrier Signal** is **modified** with respect to the **Amplitude of the Modulating Signal**.

Modulation Index (MI) (m)

Modulation Index (MI) is defined as the **ratio** of the **Amplitude of the Message Signal** to that of the **Amplitude of the Carrier Signal**.

$$m = \frac{E_m}{E_c}$$

Alternate Definition :

$$m = \frac{E_{max} - E_{min}}{E_{max} + E_{min}}$$

DSB – SC → Double Side Band – Suppressed Carrier Signal.

SSB – SC → Single Side Band – Suppressed Carrier Signal.

Introduction to Signals