

COMMUNICATION

Third stage

Electrical Power & Machines Engineering Department

College of Engineering

University of Diyala

Lecture 5

By

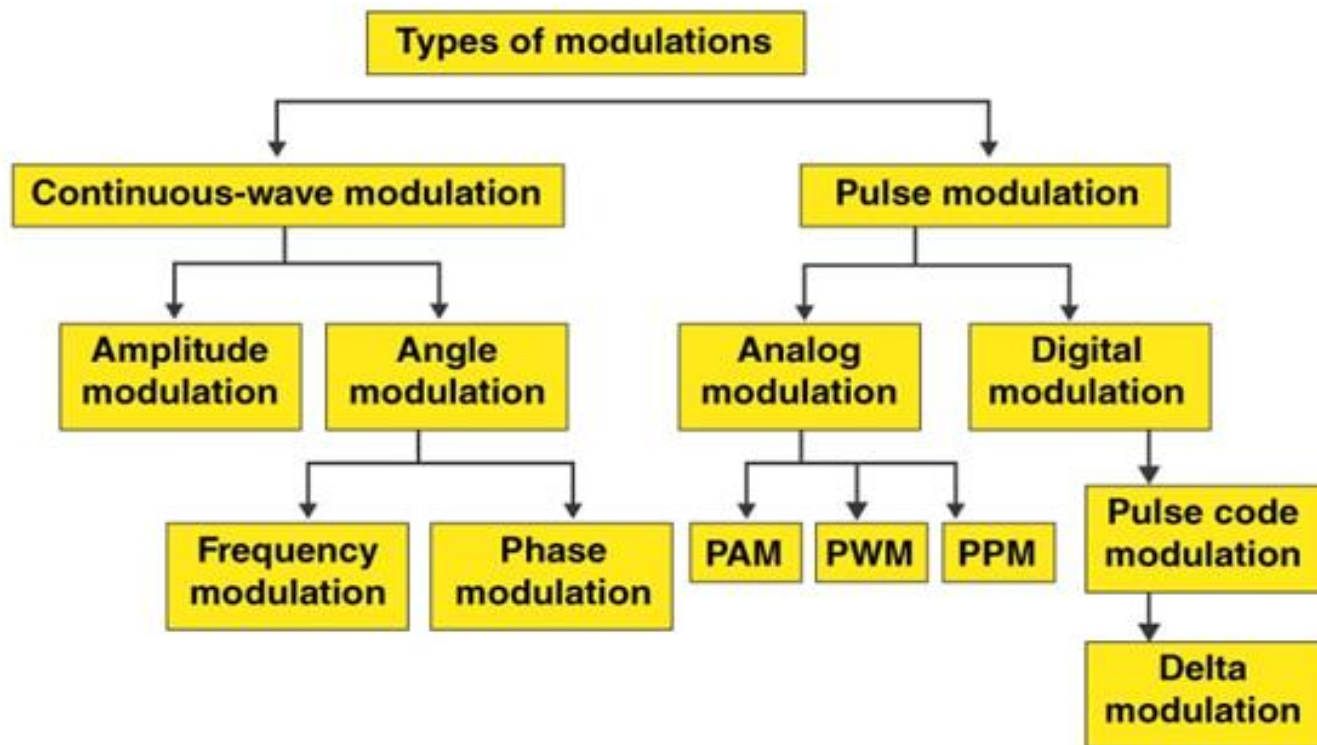
Saja M. Sami

PULSE MODULATION

The process of transmitting signals in the form of pulses (discontinuous signals) by using special techniques.

The Chapter includes:

- Pulse Amplitude Modulation
- Pulse Width Modulation
- Pulse Position Modulation
- Pulse Code Modulation

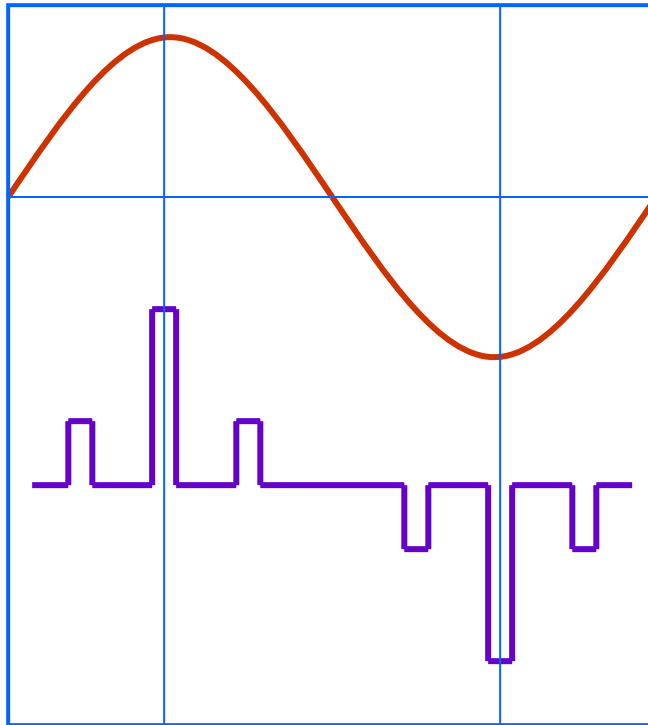
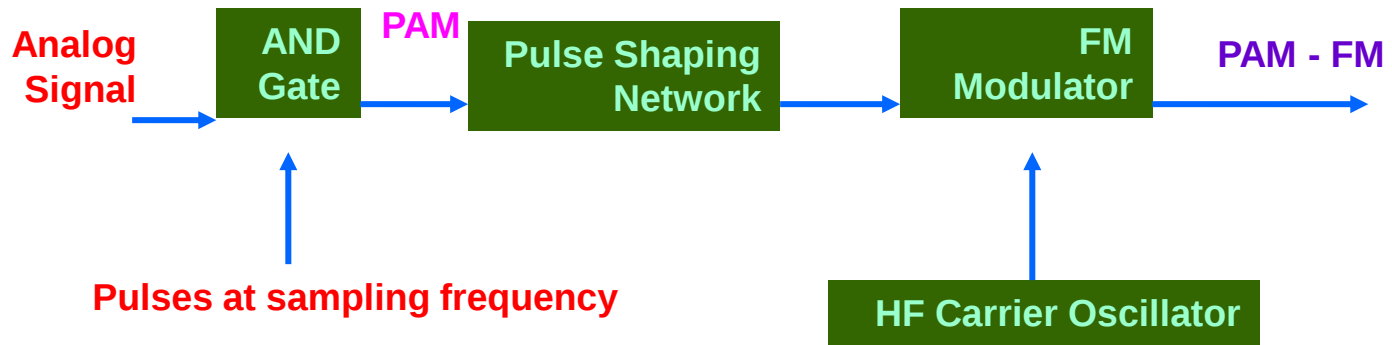


BLOCK DIGRAM OF MODULATION

Pulse Amplitude Modulation (PAM):

- The signal is sampled at regular intervals such that each sample is proportional to the amplitude of the signal at that sampling instant. This technique is called “sampling”.
- *For minimum distortion, the sampling rate should be more than twice the signal frequency.*

Pulse Amplitude Modulator



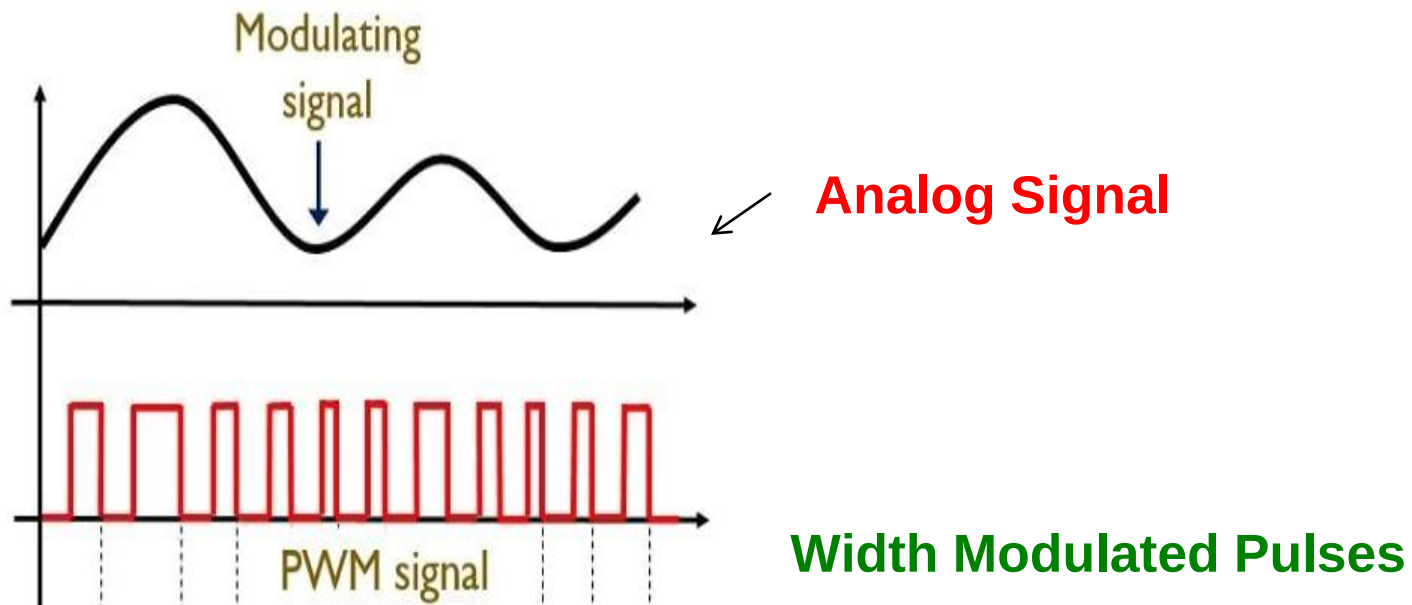
Analog Signal

Amplitude Modulated
Pulses

Pulse Width Modulation (PWM or PLM or PDM):

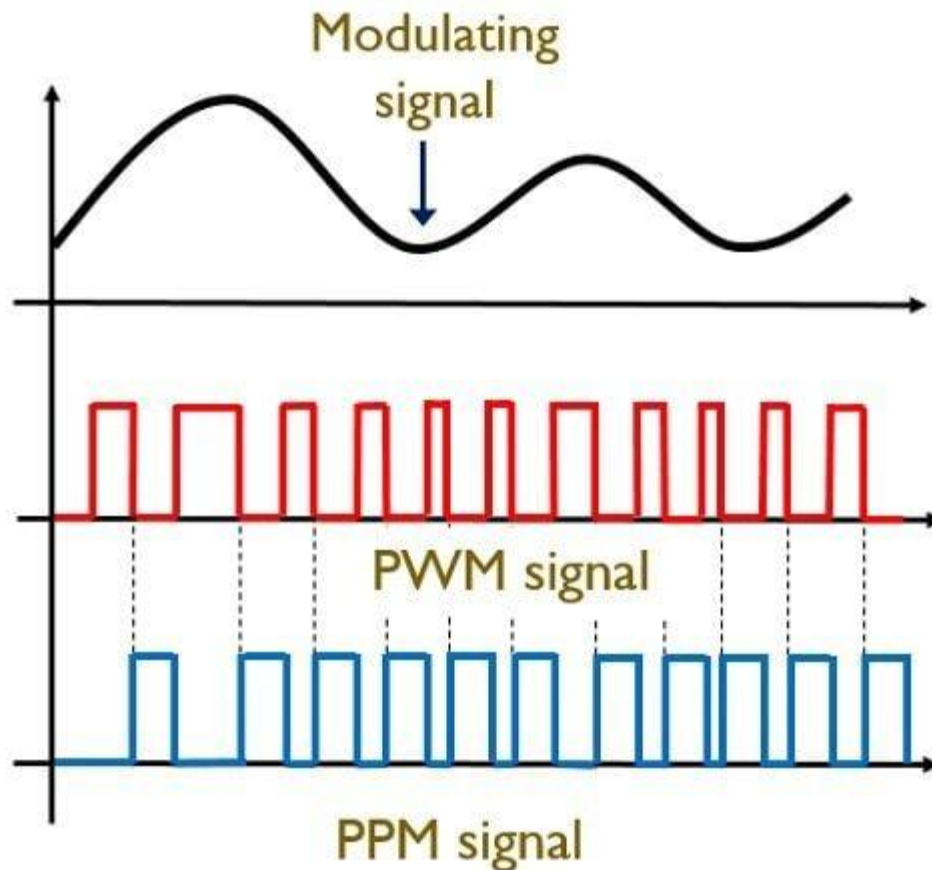
* In this type, the amplitude is maintained constant but the duration or length or width of each pulse is varied in accordance with instantaneous value of the analog signal.

* The negative side of the signal is brought to the positive side by adding a fixed d.c. voltage.



Pulse Position Modulation (PPM):

* In this type, the sampled waveform has fixed amplitude and width whereas the position of each pulse is varied as per instantaneous value of the analog signal.



Pulse Code Modulation (PCM):

- * Analog signal is converted into digital signal by using a digital code.
- * Analog to digital converter employs two techniques:
 1. Sampling: The process of generating pulses of zero width and of amplitude equal to the instantaneous amplitude of the analog signal. The no. of pulses per second is called “sampling rate”.
 2. Quantization: The process of dividing the maximum value of the analog signal into a fixed no. of levels in order to convert the PAM into a Binary Code. The levels obtained are called “quantization levels”.
- * A digital signal is described by its ‘bit rate’ whereas analog signal is described by its ‘frequency range’.
- * Bit rate = sampling rate x no. of bits / sample

