SNS COLLEGE OF TECHNOLOGY
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Coimbatore-35

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECB301-ANALOG AND DIGITAL COMMUNICATION

III YEAR/ V SEMESTER

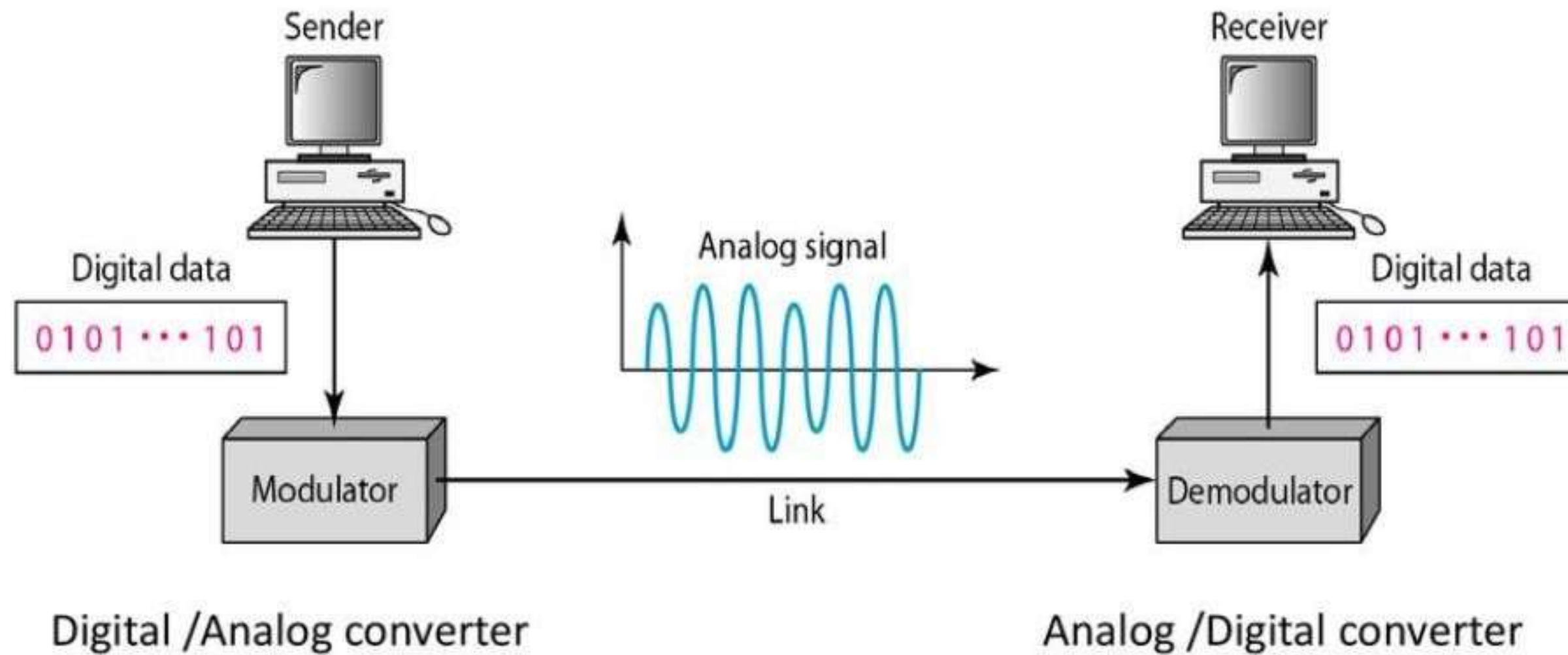# UNIT 4 – DIGITAL MODULATION TECHNIQUES

TOPIC – ASK

WHY WE NEED THE DIGITAL MODULATION?

- Digital modulation is required if digital data has to be transmitted over a medium that only allows analog transmission (modems in wired networks).

- Digital signals, i.e. 0/1, can be sent over wires using voltages.

- Wireless must use analogue sine waves.

- **This translation is performed by digital modulation:**

  - Digital data is translated into an analog signal (baseband).

  - Shift Keying is the translation process.
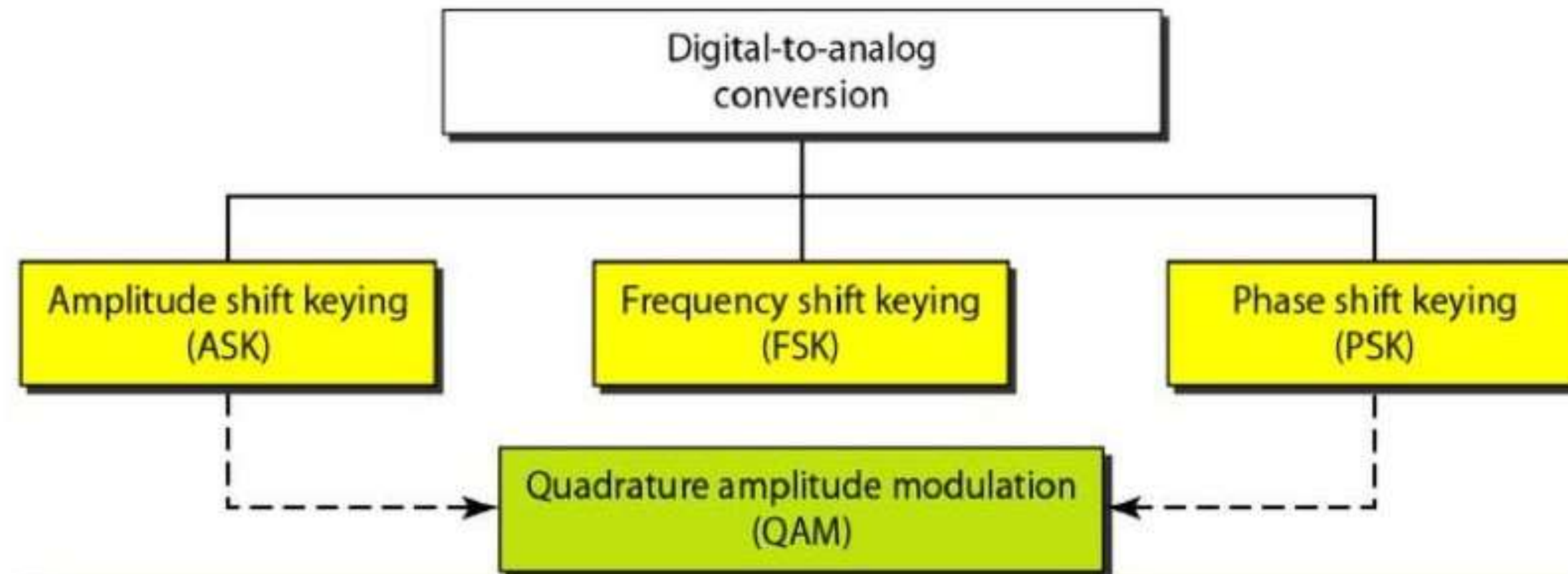
  - Amplitude, Freq., Phase Shift Keying (ASK/FSK/PSK).

MODULATION OF DIGITAL DATA

- A sine wave is represented by three characteristics: Amplitude, Frequency and Phase.

- We can change one of these characteristics to represent digital data.

ASPECTS OF DIGITAL TO ANALOG CONVERSION

- Carrier Signal or carrier frequency:

- A high frequency signal that acts as a basis for the information signal.

- Digital information then modulates the carrier signal by modifying one or more of its characteristics (Amplitude, frequency or phase).

- This kind of modification is called modulation or shift keying, and the information signal is called modulated signal.
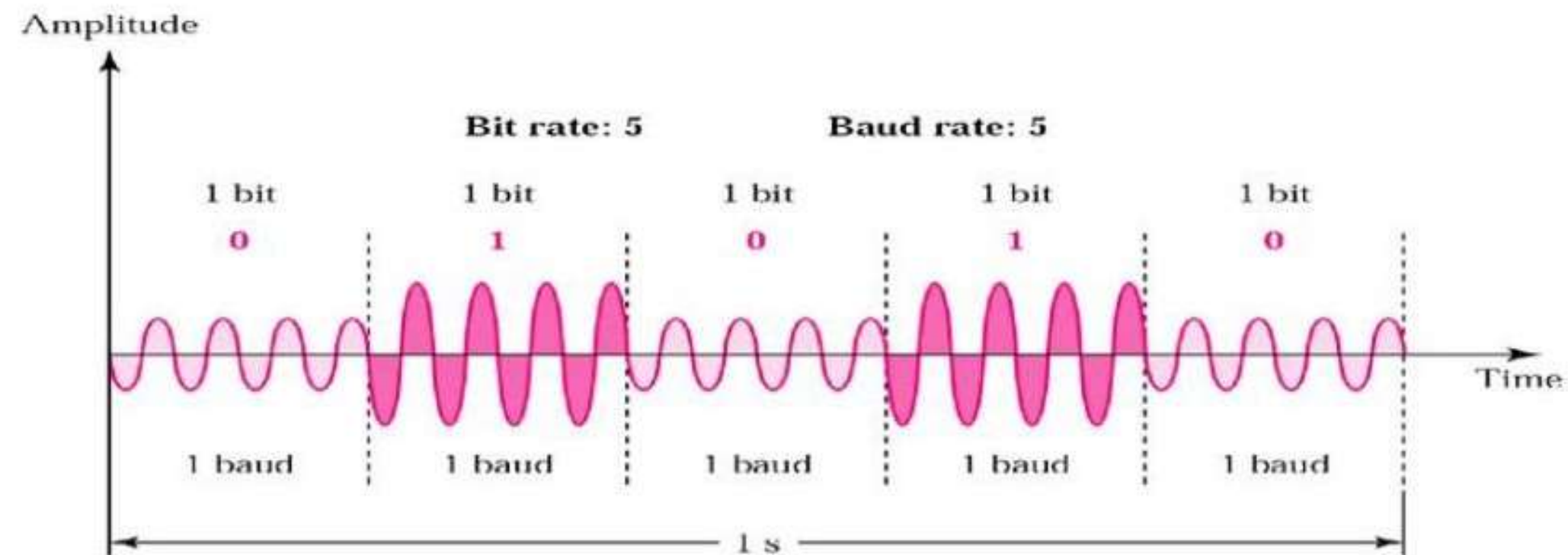
WAVEFORM

ASK modulated signal
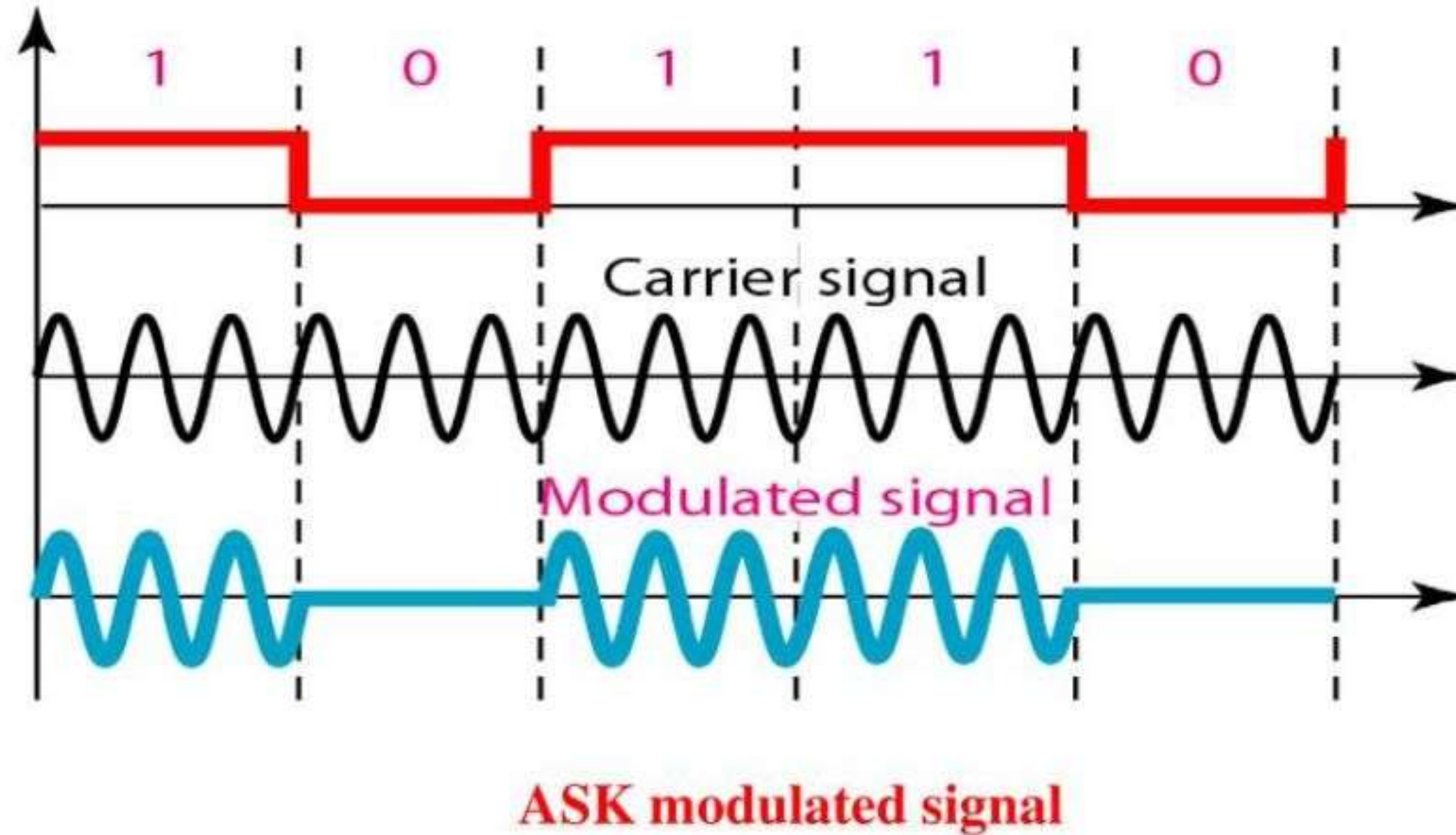
BIT RATE AND BAUD RATE

- **Bit rate:** is the number of bits per second (bps).

- **Baud rate (Nbaud):** is the number of signal units per second (baud/s).

A signal unit (one baud) is composed of 1 or more bits

AMPLITUDE SHIFT KEYING

- In **ASK** the amplitude of the carrier signal is varied to represent binary 1 or 0.

- Both frequency and phase remain constant while the amplitude changes.

- The peak amplitude of the signal during each bit duration is constant, and its value depends on the bit (0 or 1).

AMPLITUDE SHIFT KEYING

- **Amplitude Shift Keying (ASK):**

- 0 and 1 represented by different amplitudes.

i.e. a basic sine wave.

- **Problem:** susceptible to interference.

- Constant amplitude is hard to achieve.

- ASK is used for optical transmissions such as infra-red and fiber (simple + high performance).

- In optical → light on = 1 light off = 0

BASK OR OOK

- Although we can have several levels (kinds) of signal elements, each with a different amplitude, ASK is normally implemented using only two levels. This is referred to as binary amplitude shift keying.

- We can think of a carrier signal as an ON or OFF switch. In the modulated signal, logic 0 is represented by the absence of a carrier, thus giving OFF/ON keying operation and hence the name given OOK.
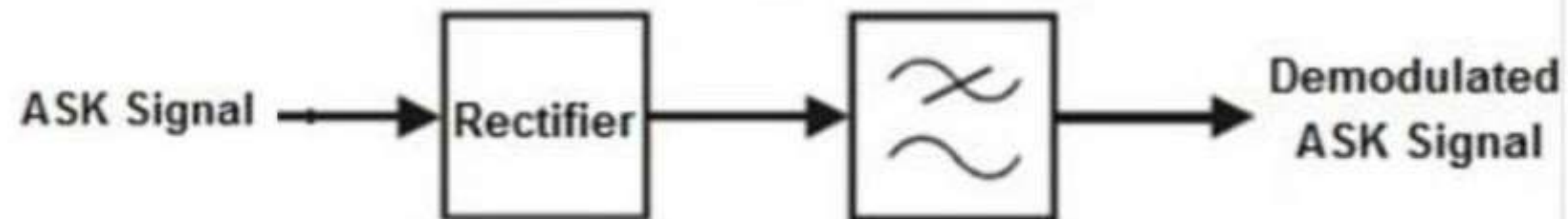
ASK GENERATION
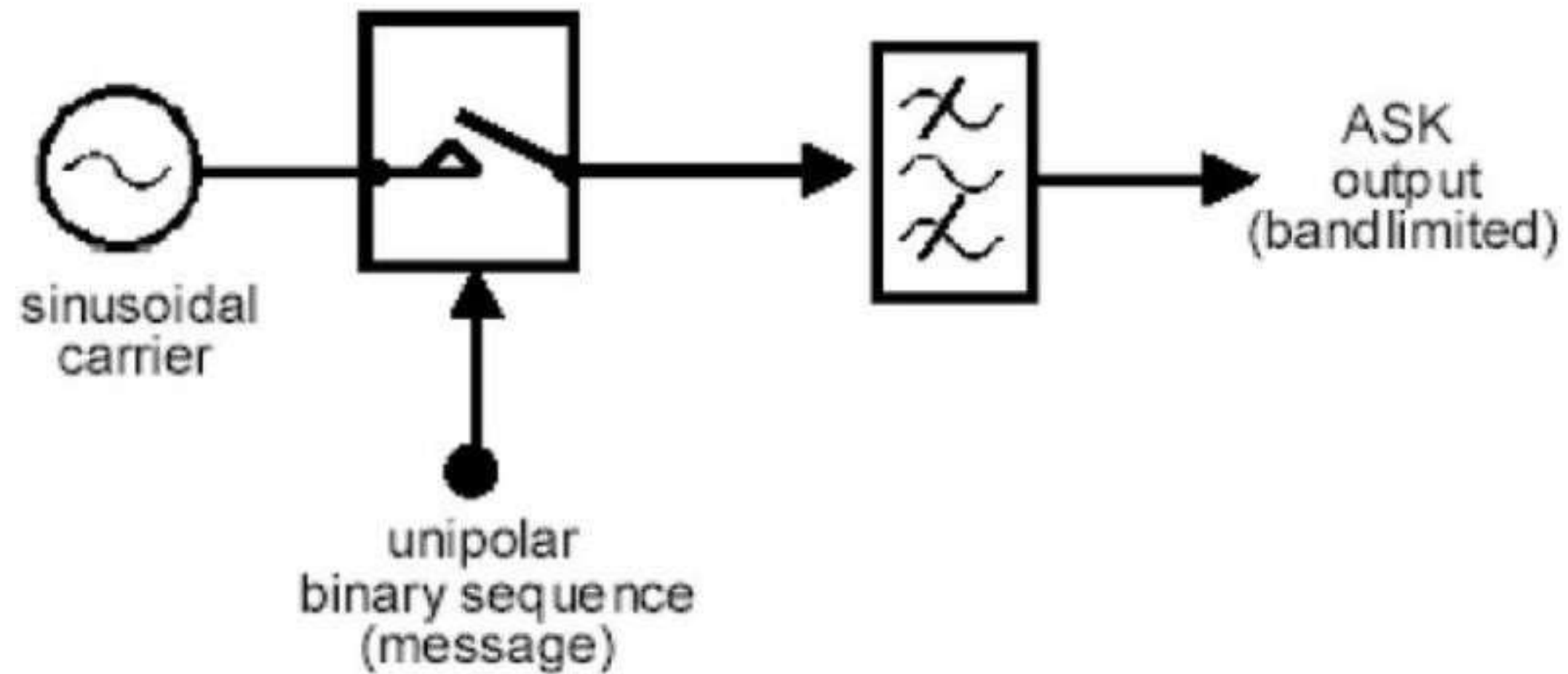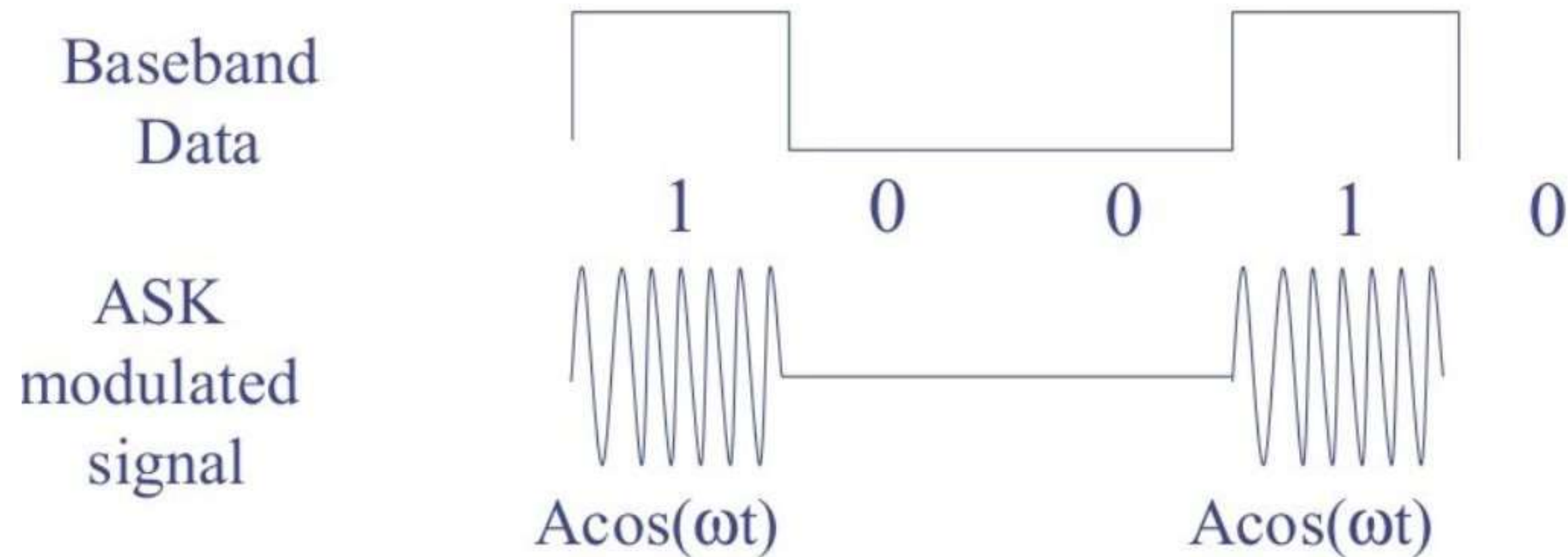
ASK DEMODULATOR OR DETECTOR

- The demodulator determines the amplitude of the received signal and maps it back to the symbol it represents, thus recovering the original data.

MATHEMATICAL REPRESENTATION

◆ Pulse shaping can be employed to remove spectral spreading
◆ ASK demonstrates poor performance, as it is heavily affected by noise, fading, and interference

ADVANTAGES,DIS ADVANTAGES AND APPLICATIONS

- Pros:

ASK transmitter and receiver are simple to design.

ASK needs less bandwidth than FSK.

- Cons:

ASK transmission can be easily corrupted by noise.

- Application:

Early telephone modem (AFSK).

ASK is used to transmit digital data over optical fiber.

THANK YOU