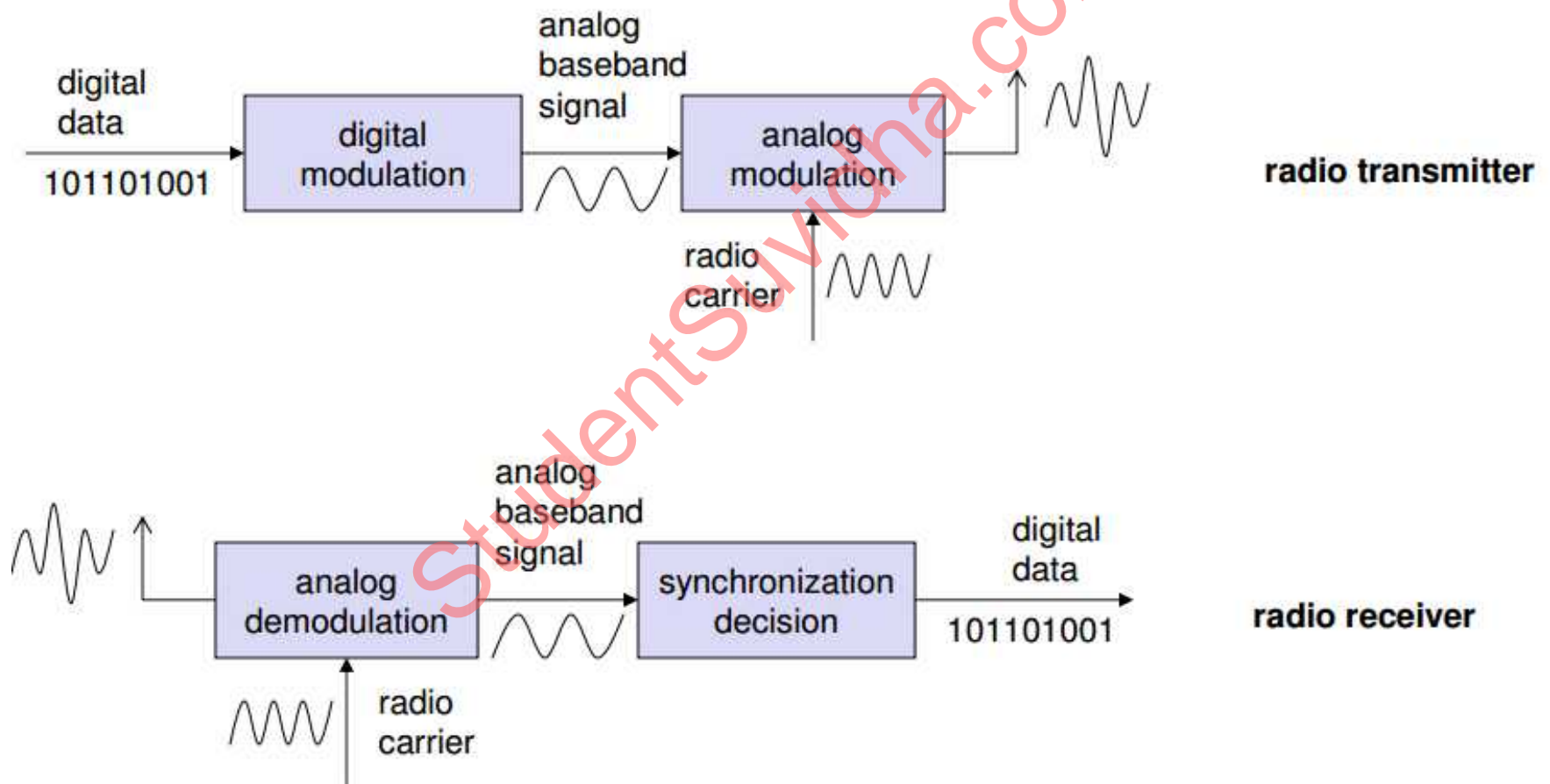


# MODULATION

# Definitions

- When data is propagated by means of electrical signals, the signals may be in either digital or analog form.
- An ANALOG signal is a power range that varies continuously. Ex: Human Voice
- A DIGITAL signal is a power range that is represented in discrete values i.e. 0, 1.
- MODULATION is the technique of converting a digital signal to its analog form.
- DEMODULATION is the technique of converting an analog signal to its digital form.

# Modulation & Demodulation Example



# Modulation Techniques

- There are three types of modulation:

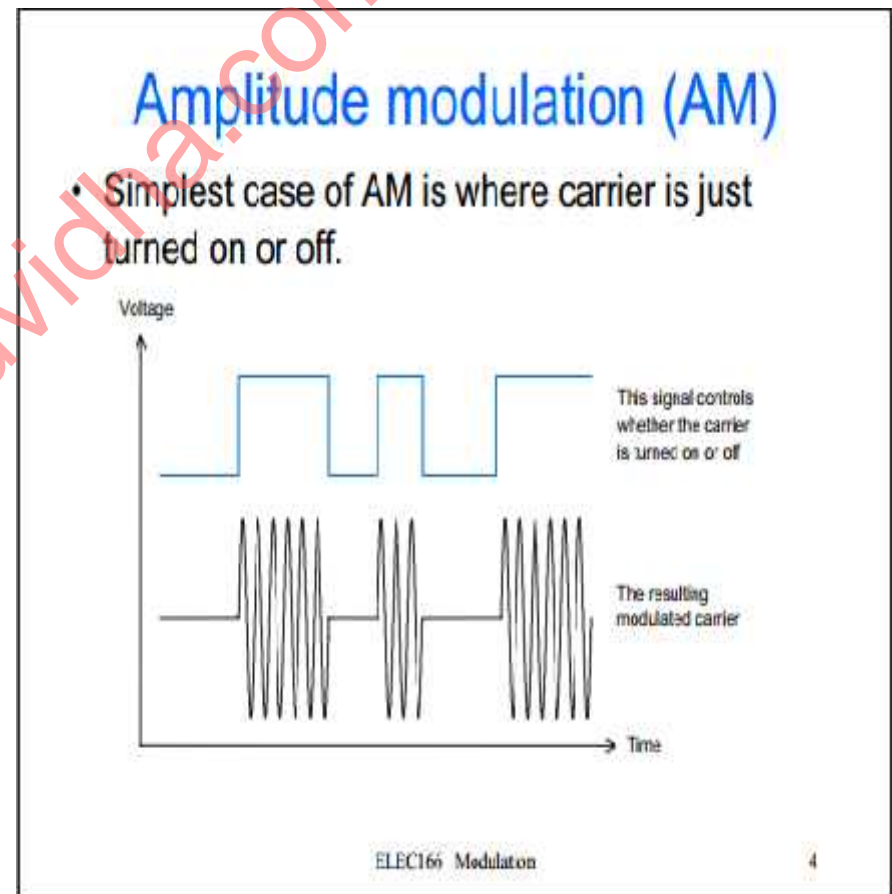
- ❖ Amplitude Modulation

- ❖ Frequency Modulation

- ❖ Phase Modulation

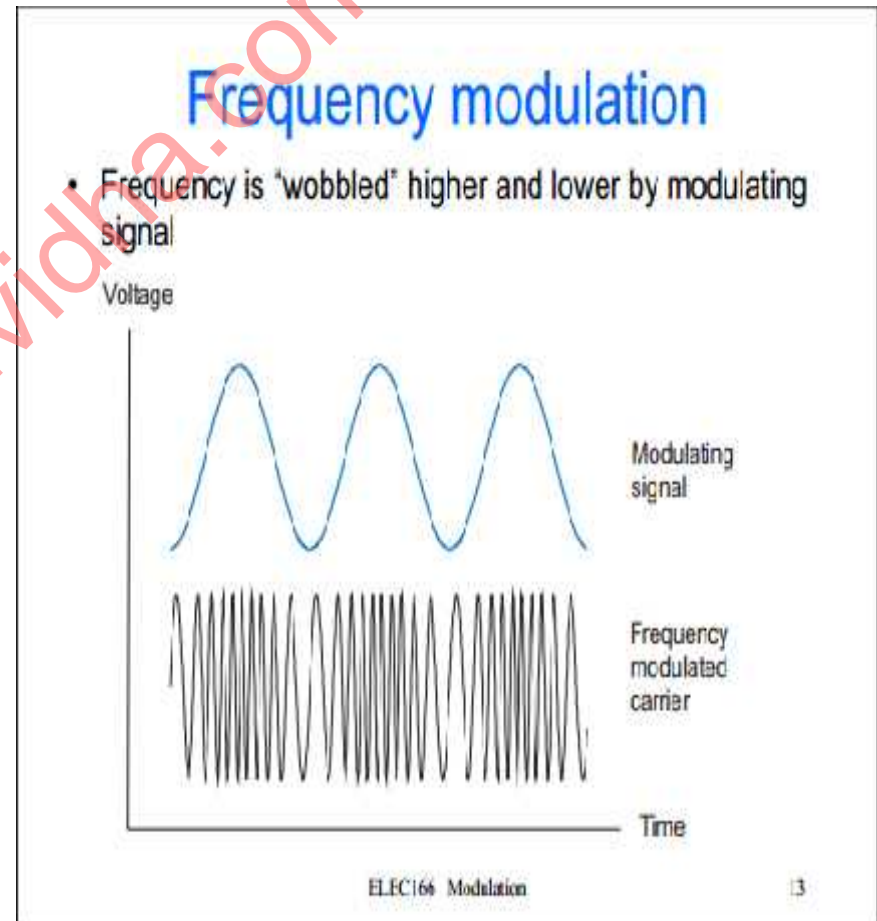
# Amplitude Modulation

- In this modulation, two binary values (0 & 1) of digital data are represented by two different amplitudes (or voltages level) of the carrier signal, keeping frequency & phase constant.
- The high amplitude indicates 1 & the low amplitude represents 0.
- This type of modulation is used in transmission of data over optical fibers.
- Amplitude modulated signals are sensitive to impulse noises that arise due to electrical sparks near transmission lines.



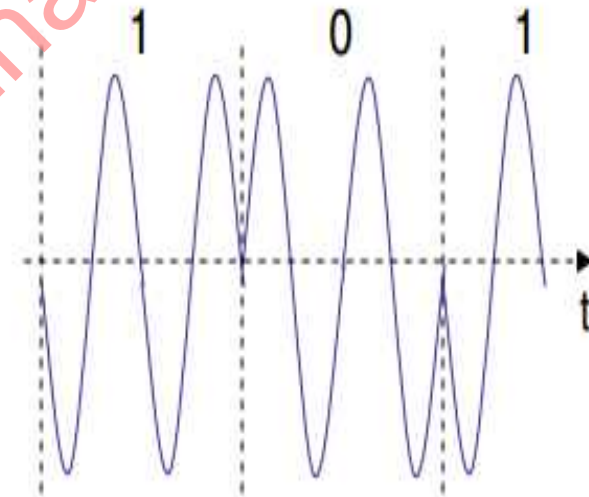
# Frequency Modulation

- In frequency modulation the binary values are represented by two different frequencies of the carrier wave, keeping amplitude & phase constant.
- This modulation technique is less susceptible to error than amplitude modulation.
- It is also easier to design devices based on this modulation, because discrimination between two frequencies is simpler than detecting phase changes.
- This modulation technique is used for high frequency radio transmission.



# Phase Modulation

- In phase modulation, two binary values of digital data are represented by shift in phase of carrier signal.
- That is, a sine wave with phase = 0 degree represents a 1, & a sine wave with phase = 180 degree represents 0.
- This technique is more noise resistant & efficient than both AM & FM techniques.
- For high speed transmission on telephone lines of 9600 bps, phase modulation is more reliable & preferred to other methods.



# Assignment

- Explain the term modulation and demodulation.