



# **SNS COLLEGE OF TECHNOLOGY**

## **An Autonomous Institution**

### **Coimbatore-35**



Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade  
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

## **DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

### **19ECB301-ANALOG AND DIGITAL COMMUNICATION**

III YEAR/ V SEMESTER

### **UNIT 4 – DIGITAL MODULATION TECHNIQUES**

TOPIC – **Bandwidth Efficiency.**



# Bandwidth Efficiency.

## 2.14 BANDWIDTH EFFICIENCY

The three factors that influence the choice of digital modulation system are

- Bandwidth efficiency: The number of bits per second that can be transmitted per Hertz of channel bandwidth
- Error performance: The probability of making a bit error at the receiver, as a function of the signal-to-noise ratio
- Equipment complexity: A parameter which effectively corresponds to the cost of the system.



## Bandwidth Efficiency.

Bandwidth efficiency or Spectral efficiency or spectrum efficiency refers to the information rate that can be transmitted over a given bandwidth in a specific communication system. It is a measure of how efficiently a limited frequency spectrum is utilized by the Communication system. Bandwidth efficiency describes how efficiently the allocated bandwidth is utilized or the ability of a modulation scheme to accommodate data, within a limited bandwidth. This table shows the theoretical bandwidth efficiency limits for the main modulation types. The Spectral Efficiency (measured in b/s/Hz) of a modulation scheme with transmission rate R and bandwidth B is defined as

$$\rho = R/B = \frac{\text{Transmission Bitrate (bps)}}{\text{Minimum Bandwidth (Hz)}} = \frac{\frac{\text{Bits}}{\text{second}}}{\frac{\text{Cycles}}{\text{Second}}} = \text{Bits/cycle}$$
$$\% \rho = R/B * 100\%$$

Bandwidth Efficiency is generally normalized to a 1-Hz Bandwidth and, thus it indicates the number of bits that can be transmitted through a medium for every 1 Hz. Usually Bandwidth efficiency is represented as % efficiency.



**THANK YOU**