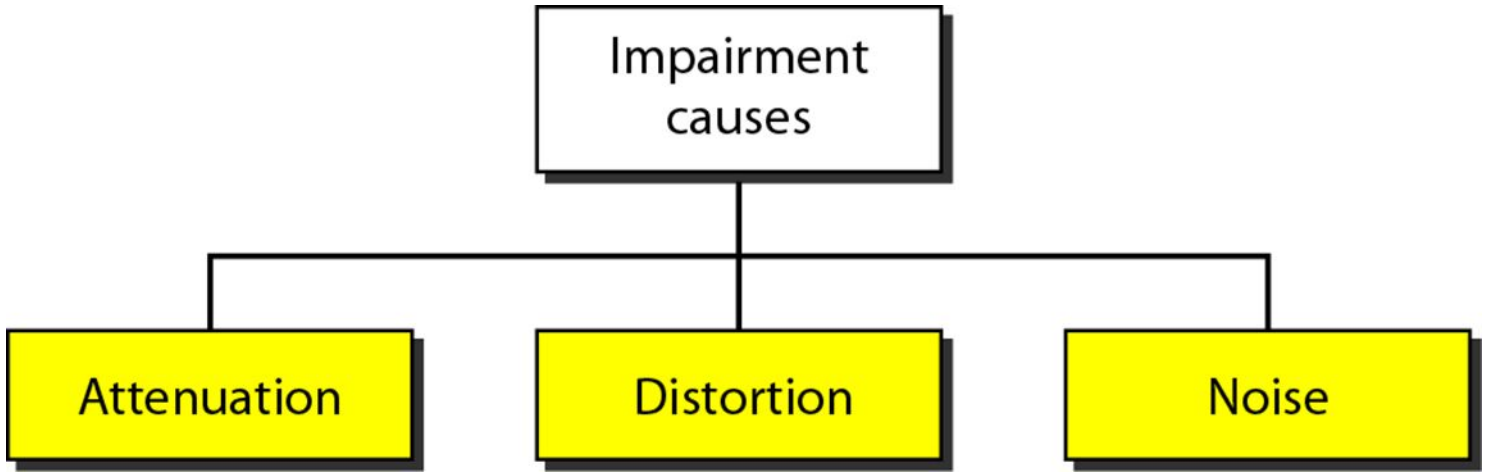
TRANSMISSION IMPAIRMENT

CSE320 – Data Communications

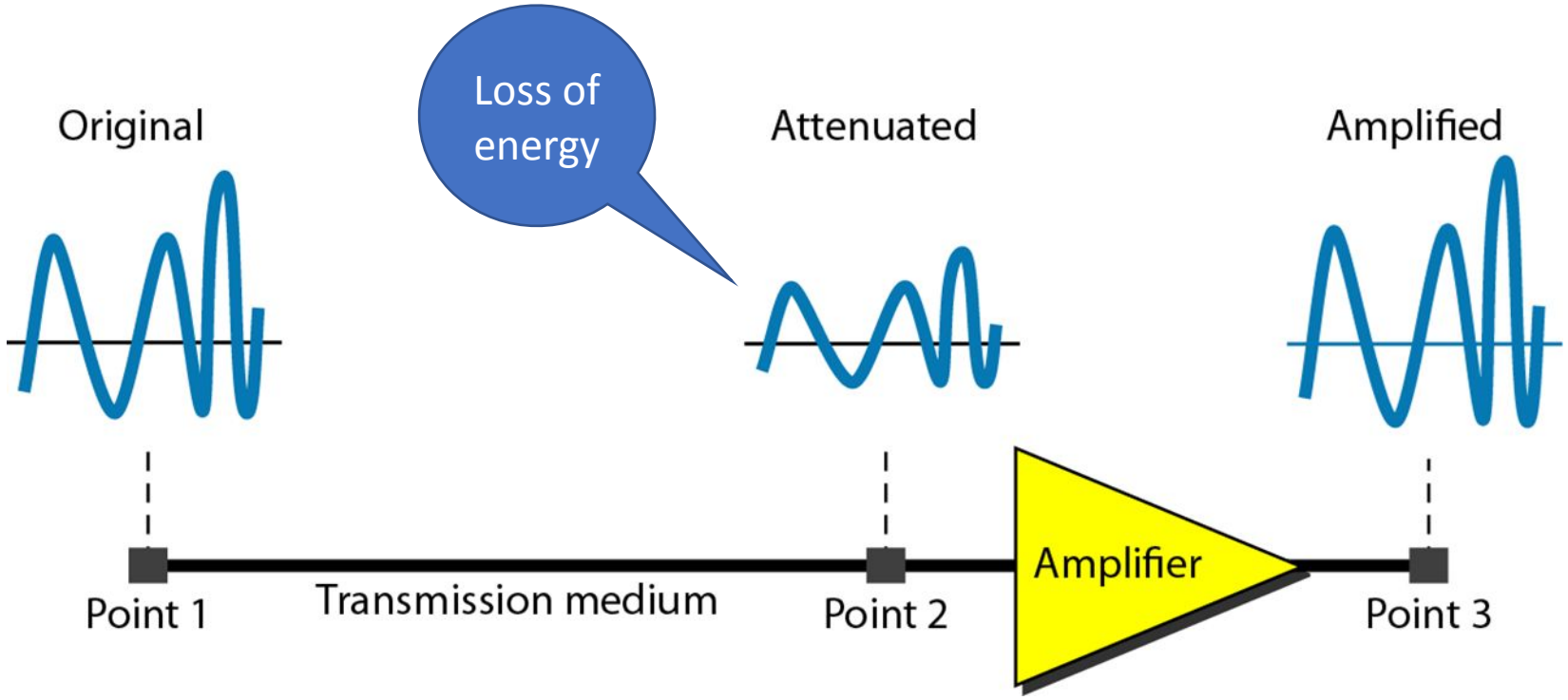
Department of Computer Science and Engineering
School of Data & Science

TRANSMISSION IMPAIRMENT

Signals travel through transmission media, which are not perfect. The imperfection causes signal impairment.



Attenuation



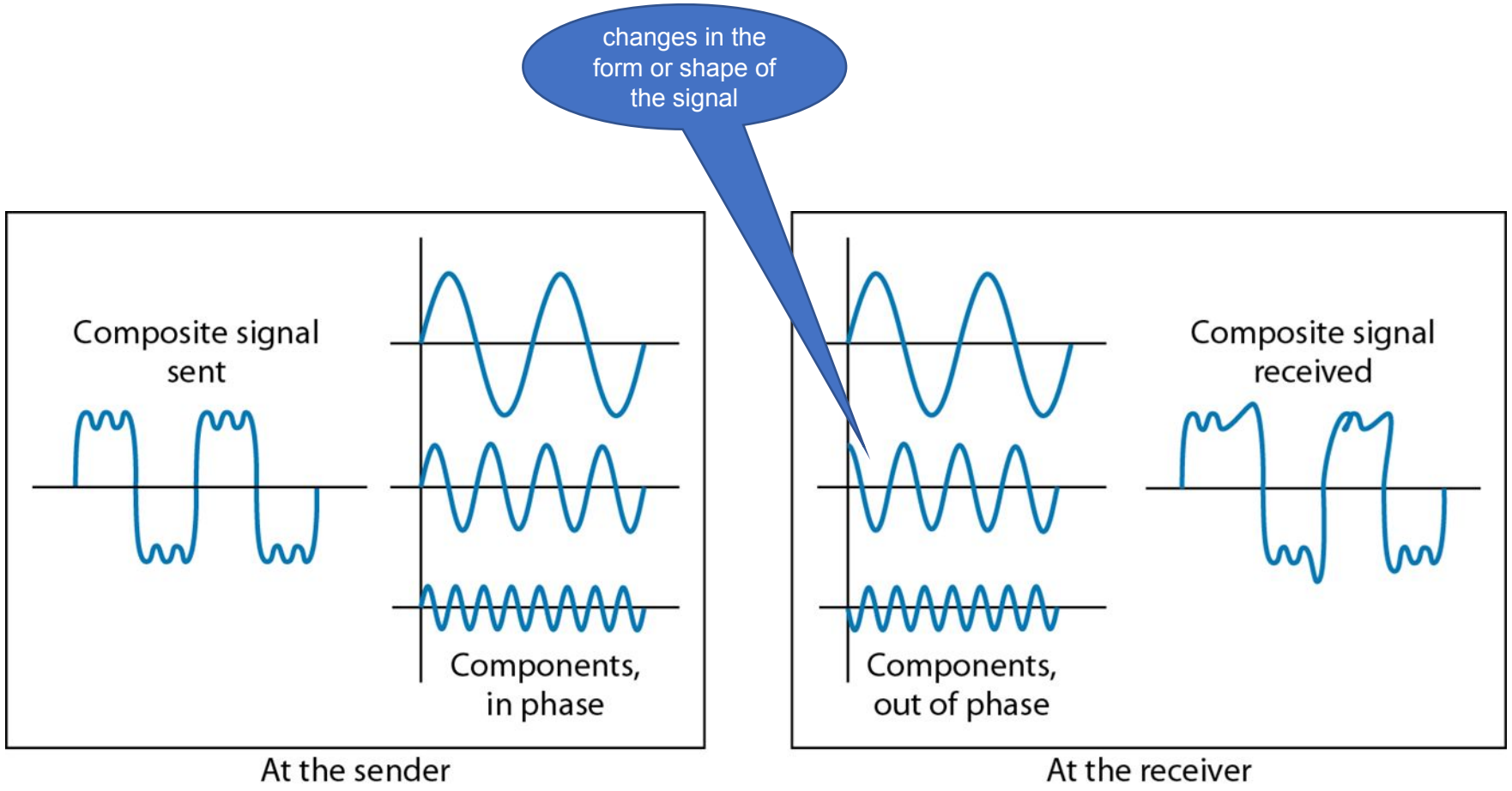
Example

- ***Suppose a signal travels through a transmission medium and its power is reduced to one-half. This means that P_2 is (1/2)P_1. In this case, the attenuation (loss of power) can be calculated as***

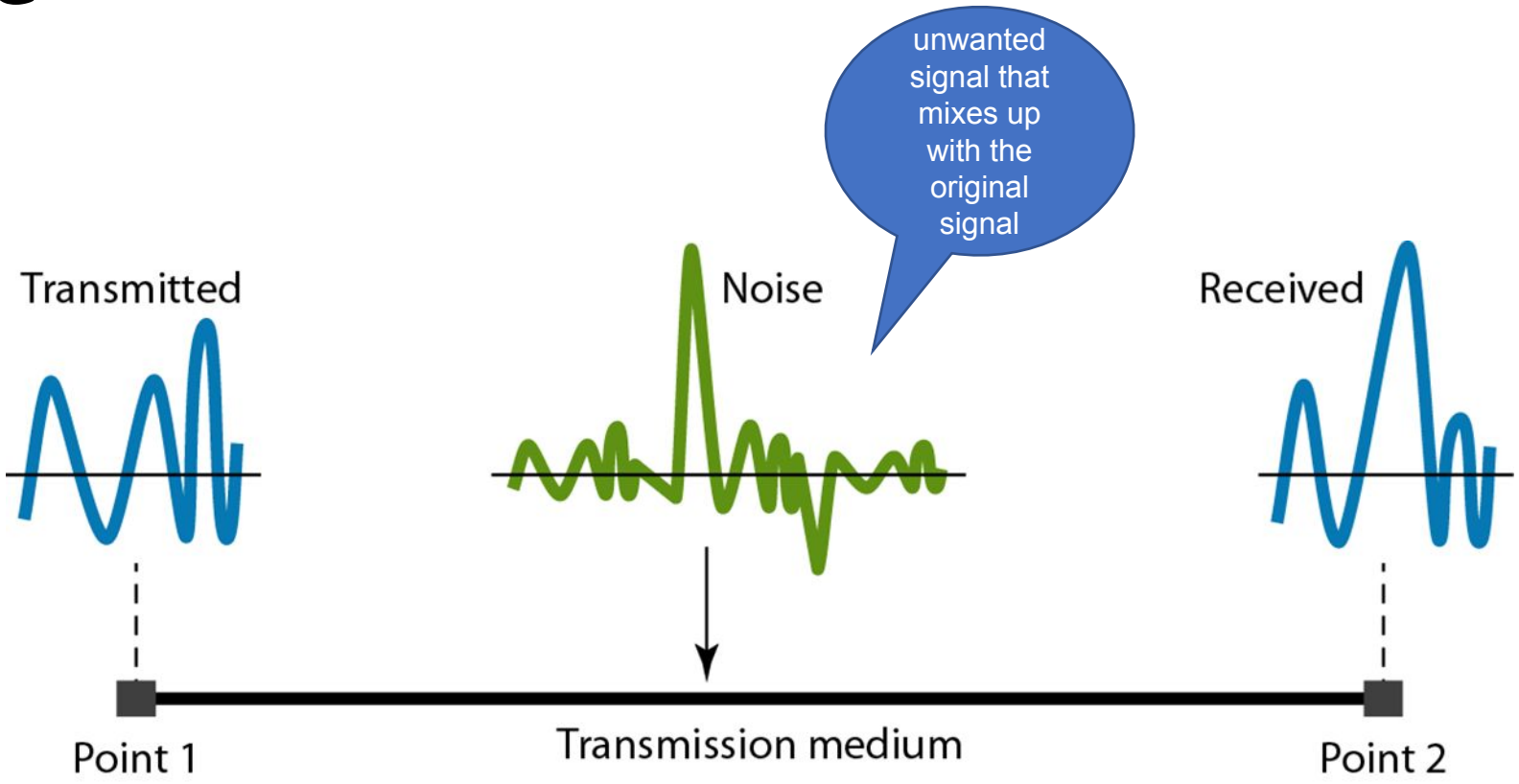
$$10 \log_{10} \frac{P_2}{P_1} = 10 \log_{10} \frac{0.5 P_1}{P_1} = 10 \log_{10} 0.5 = 10(-0.3) = -3 \text{ dB}$$

A loss of 3 dB (–3 dB) is equivalent to losing one-half the power.

Distortion


changes in the form or shape of the signal
Composite signal sent
Components, in phase
At the sender
Composite signal received
Components, out of phase
At the receiver

Noise


unwanted signal that mixes up with the original signal
Transmitted
Noise
Received
Point 1
Transmission medium
Point 2

Signal to Noise Ratio (SNR)

Example: The power of a signal is 10 mW and the power of the noise is 1 µW; what are the values of SNR and SNR_{dB} ?

Solution
The values of SNR and SNR_{dB} can be calculated as follows:

$$\text{SNR} = \frac{10{,}000\ \mu\text{W}}{1\ \text{mW}} = 10{,}000$$

$$\text{SNR}_{\text{dB}} = 10 \log_{10} 10{,}000 = 10 \log_{10} 10^4 = 40$$

$1\ W = 10^3\ mW$

$1\ mW = 10^{-3}\ W$

$10\ mW = 10^{-2}\ W$

$1\ W = 10^6\ \mu W$