

# Communication Systems

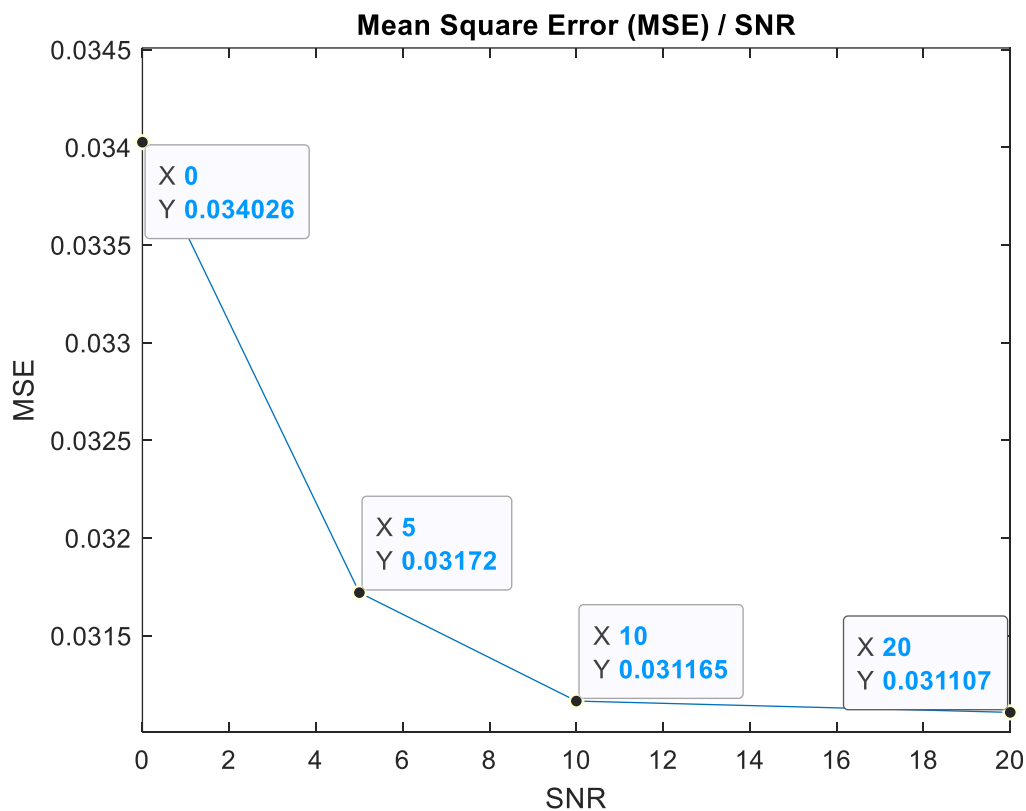
## Lab – 9

Name : Emre Nedim Hepsağ  
Submission Date: 27/05/2021

Number : 250206012

### 9.4.c Figure 1

Means Square Error formula gives as the average deviation between the generated signal and the original signal. Simply, it is used for calculating the error. It is expected to see lesser MSE at higher SNR values, because greater SNR results in lesser noise according to the signal. Thus, low noise rate results in less error. Lastly, acceleration of the MSE goes down while the SNR values goes up. Because SNR has logarithmic input instead of linear.



### 9.3.d Sound Quality

As we can see at the MSE graph, we expect the quality of the sound to be better at higher SNR values. Also, the effect of additive white gaussian noise increases at lower SNR values. SNR is the rate of the signal power to the noise power. Thus, Lesser ratio of sound and noise at 20dB results more original like sound than 0dB.

Also, to obtain the message signal with least noise, we used lowpass filter. If we examine the frequency response of the sound, we see peaks at almost all frequencies. However, after 1700Hz, we observe relatively smaller peaks. That is why, I used a lowpass Butterworth filter which has 1700 cutoff frequency and order of 8. I did not use smaller order because at higher frequencies due to the lower power of the message signal, the noise dominates. I wanted to cut that frequency range out more sharply.