

ECE/EEE F311 Communication Systems (First Semester 2023-2024)

Lab-9 (Tuesday) (14-11-2023)

Objectives

In this task, the objective is to understand digital transmission using Nyquist criteria and random variable simulations.

Task 1

Convert your name to binary digit using function dec2bin. Assign rectangular pulses to binary digit '1' and '0'. Transmit digital bit-stream using polar rectangular pulses of amplitude 1. Add AWGN of variance 0.5. Apply matched filtering to improve the detection. A real time code without noise and MF is uploaded to Nalanda and Slack.

Task 2

Simulate $y = x + n$ where $x \in \{1, -1\}$ and $n \sim N(0, \sigma^2)$. Find probability of error.

```
%%Task starts //SEE THE MAIL
var=0.05; %This provides noise (next 3 lines involve the AWGN addition )
n_t=sqrt(var)*randn(1,length(m_t))
y_t=m_t+n_t;
f_t=rectpuls(t-T,2*w);
y_t=conv(y_t,f_t);%This deals with the Match Filtering , this will just reduce
the probability of error , thats all
```

```
numSymbols = 1000;
sigma = 0.5;
```

```
x = randi([0, 1], 1, numSymbols) * 2 - 1;
n = sigma * randn(1, numSymbols);
```

```
% Add noise to the symbols
y = x + n;
```

```
receivedSymbols = sign(y);
errorProbability = sum(x ~= receivedSymbols) / numSymbols; %The numerator will
provide count which shows the inout and output arent equal
disp([';Probability of Error: ', num2str(errorProbability)]);
```