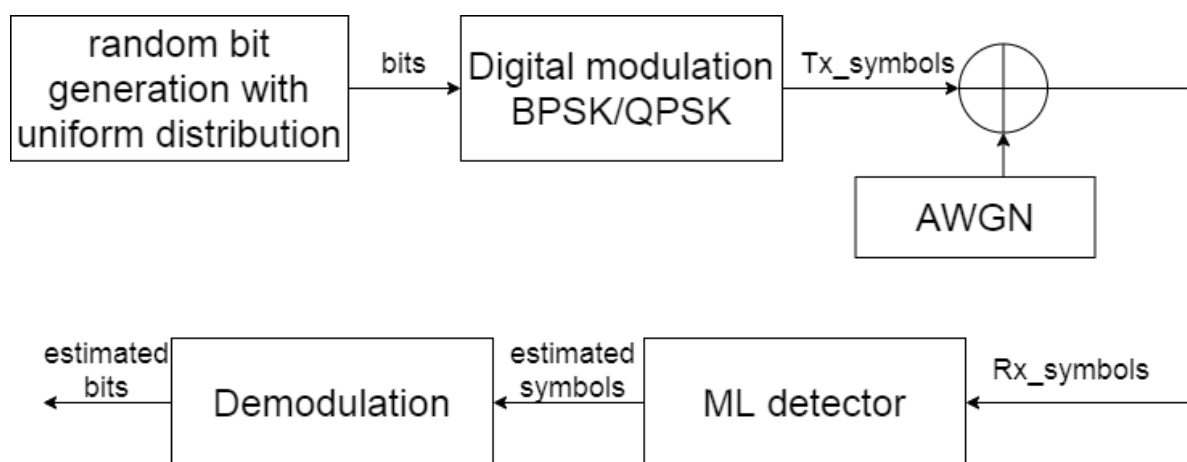# EE5801: CSP Lab/ EE5301: DSP Lab

Assignment 4

Problem:

Bit error rate(BER) and symbol error rate(SER) performance evaluation of BPSK and QPSK.

Technical details:

- For each value of E_b/N_0, take number of iterations at least 1e4 or more and do it for both BPSK and QPSK. Refer to the pseudo code given in lecture 5 pdf.
- Use the system model as $y = x + n$, $where\ n \sim CN(0, N_0)$
- The receiver must decode y based on the ML detection or minimum distance decoder. Then use the decoded output to check if the decoder was able to correctly identify the transmitted vector in this iteration. Use a counter to count the number of decoding errors for this value of E_b/N_0.
- Then find BER and SER and plot them using 'semilogy' Matlab command.

Submission Details:

- Write Matlab code to implement above communication system.
- **Coding format:** Write a single main.m file and write separate functions for digital Modulation and ML detection.
- Write your observation from the plot in your own words in MS word or latex.
- Plot all BER and SER plots in a single figure in '.fig' format. '.fig' is matlab figure format file. Use 'legends' also in figure and do 'grid on'. Your figure should contain 4 plots i.e. simulated BER and SER of BPSK and BER and SER of QPSK.
- Upload the below files in a single zip file with your id, Example: EE21MTECH11010_**A4**.zip.
  1. main.m, function.m
  2. BER and SER plot for both BPSK and QPSK in a single '.fig' file. Plot both simulated and theoritical.
  3. Pdf of your MS word or latex document.

Grading policy:

- Output – 50%
- Coding format – 30%
- Pdf submission – 20%
- Late submission – (-5)%

Notes:

- Compare your simulated BER and SER with theoretical formula as given below.
- Theoritical formula:
  - BER of BPSK = SER of BPSK = BER of QPSK =

$$Q\sqrt{2 * (E_b/N_0)_{lin}}$$

  - SER of QPSK = $2 * Q\sqrt{2 * (E_b/N_0)_{lin}}$