N = 10^6 % number of bits or symbols

rand('state',100); % initializing the rand() function

randn('state',200); % initializing the randn() function

% Transmitter

ip = rand(1,N)>0.5; % generating 0,1 with equal probability

s = 2\*ip-1; % BPSK modulation 0 -> -1; 1 -> 1

n = 1/sqrt(2)\*[randn(1,N) + j\*randn(1,N)]; % white gaussian noise, 0dB variance

Eb\_N0\_dB = [-3:10]; % multiple Eb/N0 values

for ii = 1:length(Eb\_N0\_dB)

% Noise addition

y = s + 10^(-Eb\_N0\_dB(ii)/20)\*n; % additive white gaussian noise

% receiver - hard decision decoding

ipHat = real(y)>0;

% counting the errors

nErr(ii) = size(find([ip- ipHat]),2);

end

simBer = nErr/N; % simulated ber

theoryBer = 0.5\*erfc(sqrt(10.^(Eb\_N0\_dB/10))); % theoretical ber

% plot

close all

figure

semilogy(Eb\_N0\_dB,theoryBer,'b.-');

hold on

semilogy(Eb\_N0\_dB,simBer,'mx-');

axis([-3 10 10^-5 0.5])

grid on

legend('theory', 'simulation');

xlabel('Eb/No, dB');

ylabel('Bit Error Rate');

title('Bit error probability curve for BPSK modulation');