**Aim: To study the generation of additive white gaussian noise. Also study its power spectral density and autocorrelation.**

Fs = 1000; % Sampling frequency in Hz

N = 1024; % Number of samples

t = (0:N-1)/Fs; % Time vector

% Generate Additive White Gaussian Noise (AWGN)

noise = randn(1, N);

% Plot Time-Domain Signal

figure;

plot(t, noise);

title('Additive White Gaussian Noise (Time Domain)');

xlabel('Time (s)');

ylabel('Amplitude');

grid on;

% Compute and plot Power Spectral Density (PSD)

figure;

[psd, f] = pwelch(noise, [], [], [], Fs); % Welch's method for PSD estimation

plot(f, 10\*log10(psd));

title('Power Spectral Density of AWGN');

xlabel('Frequency (Hz)');

ylabel('Power/Frequency (dB/Hz)');

grid on;

% Compute and plot Autocorrelation in Frequency Domain

noise\_fft = fft(noise);

auto\_corr\_freq = abs(noise\_fft).^2;

figure;

plot(linspace(-Fs/2, Fs/2, N), fftshift(auto\_corr\_freq));

title('Autocorrelation in Frequency Domain');

xlabel('Frequency (Hz)');

ylabel('Magnitude');

grid on;