EEE3030 MATLAB Exercise 1

1. Using the file Ch1_demo.m as a guide, generate a discrete time signal in MATLAB which is the sum of 2 sine waves with the following parameters:

Sampling frequency (fs)	1000 Hz
Time duration	1s
Frequency 1	100 Hz
Amplitude 1	1.0
Frequency 2	150 Hz
Amplitude 2	1 x 10^{-4} (0.0001 = 1e-4 in MATLAB)

2. Look at the power spectrum of this signal using the matlab function **pspectrum(x,fs)** where x is your signal vector and fs is the sampling frequency in Hz. Check that the frequencies and power values (in dB) are as expected.

3. Now quantise the signal to 4 bits ADC resolution and scale to the same amplitude as the original signal. Look at the resulting signal spectrum as above. (Hint: if you use **hold;** then you can plot the spectrum on the same axes as 2 for direct comparison.) You should see that only the larger of the two sine waves is clearly detectable. Why is this?

4. Increase the ADC resolution and observe the change in spectrum. How many ADC bits do you think are needed to clearly identify both frequency components? How many ADC bits do you think are needed match the resolution of original signal? (MATLAB uses double precision floating point arithmetic by default).