

EE 617 Sensors in Instrumentation
Autumn 2020 – Assignment 1
Maximum marks: 10

In this assignment, you will apply concepts learnt in week 1. This assignment assumes that you have access to a smartphone that has a built-in accelerometer. You will need an app that will allow you to monitor the raw output of the accelerometer for e.g. [Accelerometer meter*](https://play.google.com/store/apps/details?id=com.keuwl.accelerometer&hl=en_IN). You may use Microsoft Excel or any other spreadsheet tool for this exercise, although it is highly recommended that you start using a programming language such as python or a tool such as MATLAB for these exercises – these tools will be very useful later.

1. Let us measure the offset and noise of the Z-axis accelerometer. This is the axis of sensitivity that is oriented along direction of gravity if you place your phone on a flat surface, with the screen facing up. Identify at least thirty “flat” surfaces in your home and measure the Z-axis accelerometer output by placing your phone on these flat surfaces. For each location of the accelerometer, you should make at least ten measurements (use graph/data logger function in the app) and take their average.
 - a. Plot a histogram of the data collected at all locations, and provide a table of all measurements in your submission. Note that for each location you should use the average value as mentioned above. What are the values of the mean and standard deviation of the histogram? (3 marks)
 - b. What is the offset of the Z-axis accelerometer? (in units of [g]) (Hint: find out the value of acceleration due to gravity ‘g’ in your city, and subtract 1g from the measurements.) (2 marks)
 - c. What is the RMS noise of the Z-axis accelerometer? (in units of [g]) (2 marks)
2. Find out what accelerometer is present in your phone (your app may provide this information, or you can find out from a reputed reference/manufacturer documents). Compare the offset and RMS noise you measured to the datasheet specification for this accelerometer. What do you observe? Please explain your observations. (3 marks)

* https://play.google.com/store/apps/details?id=com.keuwl.accelerometer&hl=en_IN