EE 617 Sensors in Instrumentation
Autumn 2020 – Assignment 2
Maximum marks: 20

In this assignment, you will apply concepts learnt in weeks 2 and 3. 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*. 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. Plot the Allan deviation for the attached sensor readings (ADEV-617_HW2.csv). **You should attach your code along with your submission.** What is the bias stability (in units of [μV]) and noise density (in units of [μV/√Hz]) of the sensor? (4 marks)

2. Place your phone in a location where it will not be disturbed, and collect dataset of all three axes for a duration of at least ten minutes, at the fastest sampling rate allowed by your app. Save the data as a spreadsheet. **You will need to attach this spreadsheet with your submission.**
    a. Plot the periodogram and Allan deviation plot for each axis of the accelerometer. **You should attach your code along with your submission.** (6 marks)
    b. What is the measured noise density of each axis of the accelerometer as seen in the Allan deviation measurement? Compare these numbers to the datasheet specification for the accelerometer. (3 marks)
    c. What is the smallest change in acceleration that can be measured with each axis of the accelerometer, with averaging? (3 marks)
    d. Plot the Allan deviation of all three axes in the same plot, and comment on the offset drift. Does the offset drift show similar trend for all three axes? (2 marks)
    e. What is the RMS noise of the Z-axis accelerometer? (in units of [g]) Does it match the answer you submitted in HW1? (2 marks)

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