## Task 1 - Interface MPU6050 with Arduino

1. Apart from the general power up procedure, do the following. Use only the wire library.

* Select X gyro as the clock source.
* Set sample rate to 500Hz.
* Activate DLPF and set to 188Hz.
* Set Gyro range to 2000DPS.
* Set Accel range to 8G.

1. Use the FreeRTOS Library and read the IMU (gx,gy,gx,ax,ay,az) at 500Hz.
2. Calculate the Roll and Pitch at a rate of 100Hz without assigning a new task with the RTOS library (use the previously initiated task at 500hz) and serial print the values with the following convention.

* Right turn roll (+)
* Forward turn pitch (-)

## Task 2 – Assignment in MATLAB

1. Attached with this are 2 data sets from an IMU mounted on a pedal of a pedaling machine (similar to a bicycle).

* Forward.csv – data while cycling forward
* Reverse.csv – data while cycling reverse

1. Data containing in 7 columns are in the following order.

* Time stamp in 10ms intervals, ax, ay, az, gx, gy, gz

1. Task is to implement a function to detect the following.

* Cycling direction – Has to detect whether forward or reverse with higher accuracy. Simply when running the forward.csv the function should not detect the cycling direction as reverse.
* Cycling Rate – Strides per minute or rounds per minute count.

1. Hints –
   * Use of the timestamp field is not mandatory unless you can implement a model with the time to improve the accuracy.

* Use of all the data columns is not necessary. You may select suitable fields to detect above parameters.
* You may use low pass, complementary low pass if necessary.
* No need to output the cycling direction and rate as same as the data input rate. As an example, if you input 100 datapoints, no need to output 100 cycling directions and cyclic rates. Returning even 2, 3 outputs would be enough.

1. Compare the accuracy with the following parameters. This is for the forward.csv file which obviously should output the cyclic direction as forward. The cycling rate should roughly be around 50 at the end of the dataset.