**CpE 4010 – Lab 8**

• Objective: To have the student experiment with an integrated 3-axis accelerometer/LED array circuit wherein the 3-axis accelerometer output represents our "sensed" input and the LED array state and Serial Monitor display our "actuated" outputs.

• Procedures will be highlighted in red boxes; some procedures require you to collect data for your report. Enter all required data in the appropriate field within the accompanying Datasheet. Also, be sure to enter your name at the top of the Datasheet

• Once you have completed all of the following procedures and filled in your Datasheet, upload your complete Datasheet to the "Lab 8" folder under "Assignments"

1) Construct the MPU-6050 IMU circuit below.
Note: INT connection is not required. Better to position the sensor on a flat surface (such as breadboard on the table).
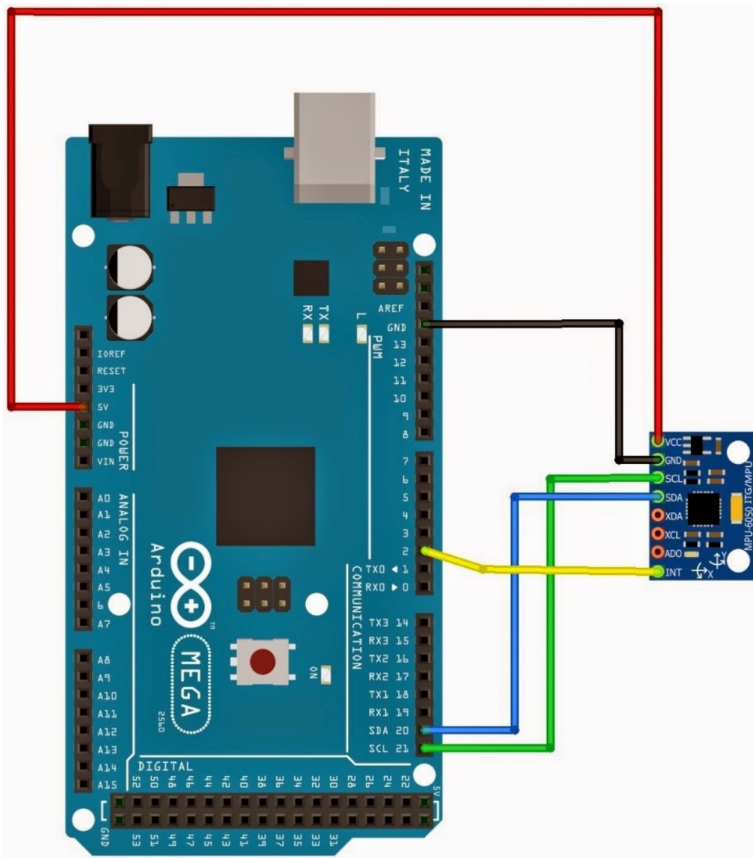
2) Go to this link:
https://github.com/jarzebski/Arduino-MPU6050
and download MPU6050 library for Arduino. Add the library to Arduino IDE.
2a) From File->Examples->Arduino-MPU6050-Master, find and open MPU6050_accel_simple. Save as the code to a new sketch.
2b) Compile, upload and run the sample code. Start your serial monitor with proper baudrate and move your sensor to see if the output is detected.

3) **Record the output of each axis of the sensor when it is motionless into the appropriate fields of your Datasheet.**

4) **Modify the code to display only normalized acceleration values of the IMU sensor. Experiment to determine the maximum and minimum acceleration that you can cause in one direction (X, Y or Z - axis).** Enter this value in the corresponding field of your Datasheet

5) **Take the value you determined in the previous step and divide it by three**

6) Modify your circuit and source code so that a linear array of seven LEDs corresponds to the acceleration of your sensor in one direction; e.g. X-axis. When no acceleration is detected the center LED is illuminated. When acceleration to the right occurs, the right-side LED corresponding to the amount of acceleration is illuminated—each subsequent LED from center in the rightward direction represents one-third of the maximum acceleration that you experimentally determined before and vice versa for leftward accelerations

7) **Take a picture of the circuit with an acceleration LED illuminated while you are moving the sensor, and insert it into the associated section of your Datasheet**

8) **Take a screenshot of your Serial Monitor window showing various acceleration message(s) displayed during acceleration and insert it into the associated section of your Datasheet**

9) **Take a screenshot of your IDE code window showing your modified source code and insert it into the associated section of your Datasheet**

10a) Go to below link and check the sample code which calculates the angle of rotation.
https://www.hobbytronics.co.uk/accelerometer-info

10b) Modify your code to display angle for roll (X-axis) on the serial monitor.
Set the delay to 1 sec for proper visualization. Take a screenshot of your code and serial monitor which shows different angles of rotation for roll, and insert it into the associated section of your Datasheet.

11) Write a conclusion in the "Conclusions" section of the Datasheet explaining your observations and lessons learned