MPU6050 IMU - Gyroscope and Accelerometer

Notes for using the tutorials listed below:

1- To learn how to connect the MPU6050 to the Arduino watch the Dronebotworkshop video on building an electronic level. Note that when using the suggested MPU6050 library, the interrupt pin should be connected. But this should not be connected when the library is not used. Also, the Arduino pins used for I2C don't need to be initialized in the setup loop.

2- After learning how to connect the wiring, watch the two part video series by Joop Brokking. He does not use a library and explains clearly how the pitch and roll angles are calculated. I've removed the LCD display code from Joop's Arduino code to make the code simpler to follow.

3- Joop is using an I2C adapter for the LCD in his videos. This is explained in the Dronebotworkshop LCD video. The Dronebotworkshop digital level video is also using an I2C adapter on the LCD screen.

MPU-6050 6dof IMU tutorial for auto-leveling quadcopters with Arduino source code - Part 1
Joop Brokking
Good basic tutorial. Shows real examples of things like gyro drift. Start with this tutorial series. Then go on to the Dronebotworkshop tutorial.
https://www.youtube.com/watch?v=4BoIE8YQwM8

MPU-6050 6dof IMU tutorial for auto-leveling quadcopters with Arduino source code - Part 2
Joop Brokking
https://www.youtube.com/watch?v=j-kE0AMEWy4

Using LCD Displays with Arduino
Dronebotworkshop
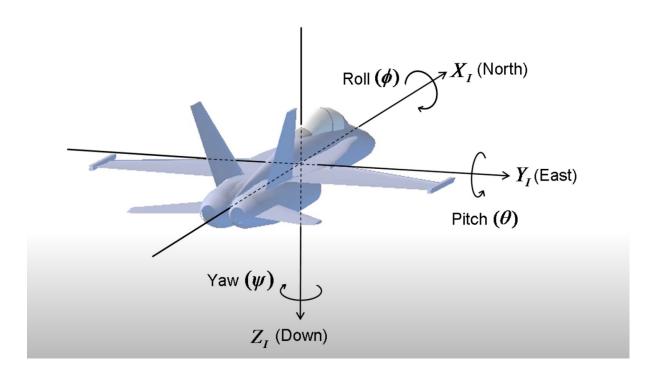Also explains the basics of I2C communication.
https://www.youtube.com/watch?v=wEbGhYjn4QI

Notes

1- Pitch, Roll and Yaw

Y - Pitch
X - Roll
Z - Yaw

"Nose up" is a positive increase in pitch angle.
"Left wing up" is a positive increase in roll angle.
"Nose rotated right" is a positive increase in yaw.

On the MP6050 there are two arrows shown. The tip of the Y arrow is the nose. Therefore, lifting the nose up and down changes the pitch angle. The tip and end of the X arrow are the wings.

2- We need the roll angle and the pitch angle. We can calculate the roll and pitch angle separately from the Gyroscope readings and from the Accelerometer readings. Each has strengths and weaknesses. Therefore, we combine the pitch and roll angles from the gyro with the pitch and roll angles from the Accelerometer to get the final pitch and roll angle.

3- The simple code to do this is attached.

4- We need to change two values in the code to calibrate our MPU6050. We place the MPU6050 on a flat surface (on a spirit level) and then enter the values we see into the code. Refer to video Part 2, 9:05, for info on the calibration procedure.

5- IMU - Inertial Measurement Unit