

# Aeromodelling Club

## Winter 2023

[2021chb1053@iitrpr.ac.in](mailto:2021chb1053@iitrpr.ac.in) (club secretary)

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**Dec 16, 2023**

### **Mission : Code self leveled plane on arduino UNO**

This mission should you choose to accept to make a self leveled plane using arduino UNO as your main processing unit. This mission is divided into multiple levels.

Upon completion of this mission selected projects will be given materials to build the complete model and fly it across the ground.

#### **Level ONE:**

Components given:

Arduino Uno: Main processing unit.

Inertial Measurement Unit (IMU): To measure the plane's orientation (pitch, roll, and yaw). MPU6050 is preferred.

Servo Motors: To control the control surfaces (e.g., ailerons, elevators, rudders).

Power Supply: Suitable power source for the Arduino Uno and servo motors. LIPO batteries will be used.

Airframe: The physical structure of the plane.

#### High Level Details:

In this level you have to code your plane model in arduino IDE and your main focus should be on self leveling of the plane in roll and pitch axis only. The code should be properly commented, or else it will be eliminated. This can be performed alone or in a group.

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### Low Level Details:

You will be implementing a PID control system on the servos to maintain the same level in pitch and roll axis. The gyro provides you the accelerometer and gyroscope data at 50Hz which is enough for RC plane, your control system at the end should manipulate the servos responsible for the movement in roll and pitch axis. You may follow the provided resources shared with this doc.

### Submission Details:

Submit the code as well as documentation which includes team name, members details, Level you have chosen and any other information you would like to share with the club.

### Note:

As we may not provide you with the necessary components you may use your imagination and we can debug the code with proper equipment at the club in January.

We do not always look at working code, we will also be looking at your approach and your implementing method.

## **Level TWO:**

Components given:

Arduino Uno: Main processing unit.

Inertial Measurement Unit (IMU): To measure the plane's orientation (pitch, roll, and yaw). MPU6050 is preferred.

Barometer: To measure the plane altitude. MS5611 chip is preferred.

Servo Motors: To control the control surfaces (e.g., ailerons, elevators, rudders).

Power Supply: Suitable power source for the Arduino Uno and servo motors. LIPO batteries will be used.

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Airframe: The physical structure of the plane.

#### High Level Details:

In this level you have to code your plane model in arduino IDE and your main focus should be on self leveling of the plane in roll and pitch axis as well as maintaining altitude when given command from the transmitter. The code should be properly commented, or else it will be eliminated. This can be performed alone or in a group.

#### Low Level Details:

You will be implementing a PID control system on the servos to maintain the same level in pitch and roll axis. The gyro provides you the accelerometer and gyroscope data at 50Hz which is enough for RC plane, your control system at the end should manipulate the servos responsible for the movement in roll and pitch axis. Later you may read the data given from the MS5611 (you may use some filtering methods like kalman or complementary filters to adjust the baro data) along with the control system to manipulate the servos responsible for altitude change. You may follow the provided resources shared with this doc.

#### Submission Details:

Submit the code as well as documentation which includes team name, members details, Level you have chosen and any other information you would like to share with the club.

#### Note:

As we may not provide you with the necessary components you may use your imagination and we can debug the code with proper equipment at the club in january.

We do not always look at working code, we will also be looking at your approach and your implementing method.

#### **Resources:**

1. <https://web.mit.edu/kirtley/kirtley/binlustuff/literature/control/Kalman%20filter.pdf>
2. <https://www.elprocus.com/the-working-of-a-pid-controller/>
3. <https://www.youtube.com/watch?v=ruB917YmtgE>

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4. <https://srituhobby.com/what-is-a-pid-controller-and-how-does-it-work-with-an-arduino/>

All the best, if you have any issues or questions mail me at [2021chb1053@iitrpr.ac.in](mailto:2021chb1053@iitrpr.ac.in)

Or message me at +91 9550457919