

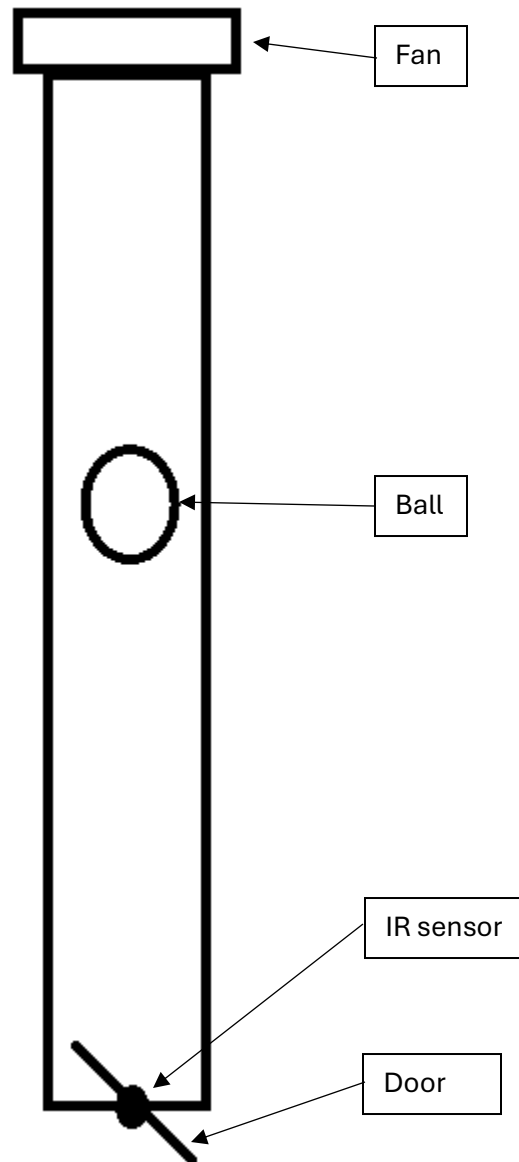
## ENEL 869 – Project Plan

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### Project description:

This project uses a stream of air to control the altitude of a floating ball. The ball will be placed in a tube with a fan at the top which will be set to run at a constant speed. At the bottom of the tube, a controllable door is fitted that can be opened to different levels to control the stream of air. By controlling the stream of air, the height that the ball would float is regulated. An IR distance sensor is installed at the bottom of the tube, this is used as feedback to the system to control the system.



### Requirements:

- The system shall control the height of the floating ball by regulating the stream of flowing air.
- The system shall use feedback from the IR sensor to determine the height of the floating ball.
- The system should be able to maintain the height of the ball within 5cm of the given height.

### Scenario:

The concept being explored is controlling the air flow. This can be made into a great tool by scaling up to simulate drone altitude control in different wind conditions. The simulation could be used to test stability and control algorithms before testing out in the real-world.

How it would work,

- The drone would be placed in the tube
- The drone would start flying
- The air control system would change the air flow to suit different scenarios and how the flight control system works in those situations will be observed.

### Functional components:

- Tube enclosure with door attached to the bottom and fan to the top.
- Servo motor connected to the door to control the level of the opening.
- IR sensor attached to the bottom of the tube to determine the distance to the floating ball.
- MCBSTM32EXL as the controller
- PID control system software to regulate the air flow by controlling the servo to change the level of the opening using the data from the IR sensor as the feedback.

### Design alternatives:

The fan can be replaced with a variable speed control fan. This would enable two types of systems to be designed,

1. The door at the bottom of the will be removed leaving just an opening. Controlling the fan speed can now be used to control the air flow and this the height of the floating ball.
2. Both the door and fan speed are controlled. Given that we have two modes of controlling the air flow, we could control the height of the ball with better precision.