# MECHANICAL DESIGN

The mechanical structure of a two-wheel differential drive mobile robot initially consisted of two Stepper motors and one caster wheel. The wheel design allowed for efficient and precise movement of the robot, and the motor provided the necessary power and control.

In the first design, the robot did not include any ultrasonic sensors for navigation or obstacle avoidance. However, as the project progressed, the design was modified to incorporate ultrasonic sensors to improve the robot's functionality. With the addition of the sensors, the robot was able to detect and avoid obstacles, making it more suitable for performing operation.

- The width of the robot is about 20cm
- The height of the robot is about 25cm
- Ultrasonic sensor is placed in the front of the robot
- pi camera is used to scan the QR code
- Above the robot we fixed a linear actuator, to adjust the height
- The robot was designed in such a way that it has a total payload of 7Kg.

Designing a robust chassis that can accommodate the Arduino Mega, NEMA17 motors, Raspberry Pi camera module, and linear actuation mechanisms is essential. The chassis should be sturdy enough to support the weight of the components and withstand the stresses of movement and lifting operations.

Proper mounting of the NEMA17 motors is crucial for efficient motion control and navigation. The motors should be securely attached to the chassis to prevent vibrations or misalignment that could affect the robot's movement accuracy.

Positioning line following sensors along the robot's underside or front bumper is vital for accurate path following. Additionally, mounting the Raspberry Pi camera module at an optimal angle and height enables clear and consistent QR code scanning and path identification

Implementing linear actuation mechanisms, such as linear slides or actuators, for the forklift operation ensures precise vertical movement for lifting and lowering objects. The design should allow for smooth and controlled linear motion to avoid jerky movements or instability during forklift operations.

Ensuring proper weight distribution across the chassis and forklift mechanism is critical for maintaining stability during movement and lifting operations. Balancing the weight of components and payload minimizes the risk of tipping or instability.

## 4.1 VIEWS


**FIG 4.1.1 FRONT VIEW**

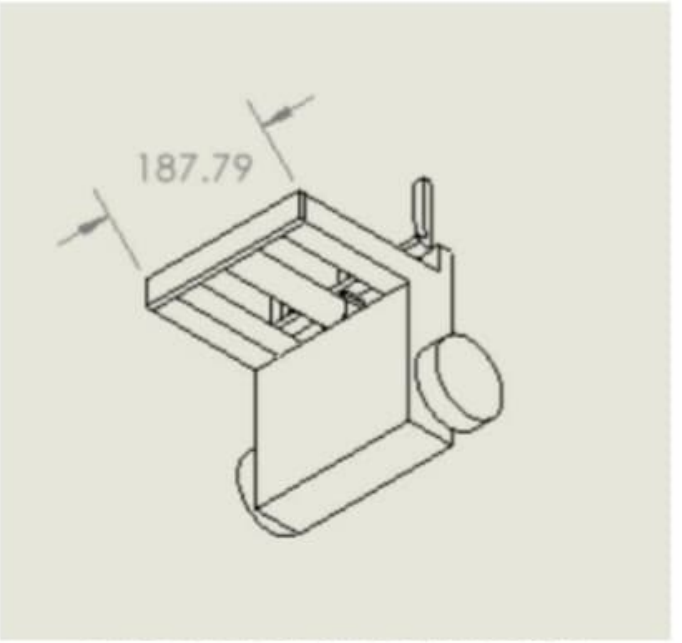


**FIG 4.1.2 ISOMETRIC VIEW**

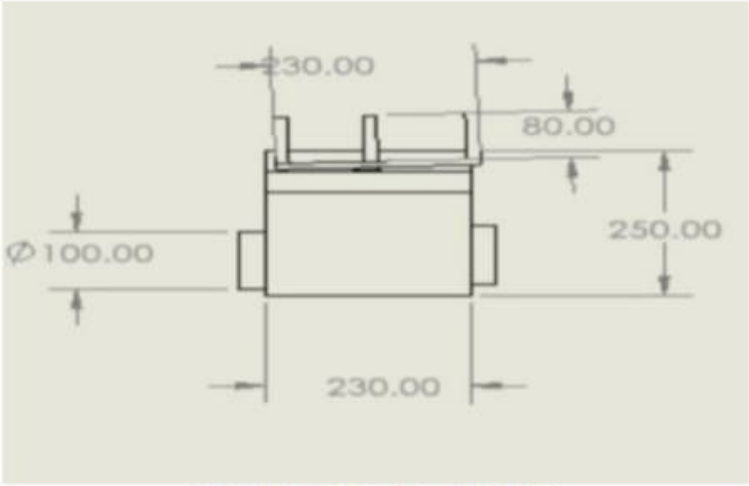


**FIG 4.1.3 TOP VIEW**

## 4.2 MATERIAL AND PARTS

| S NO. | PARTS | MATERIALS & FABRICATION | QUANTITY |
|---|---|---|---|
| 1 | Body frame | Plywood 425x20cm | 1m |
| | | Wood (Sawing) fabrication | |
| 2 | Vertical structure | Aluminium sheets 25x5cm,2mm | 3m |
| | | Aluminium fabrication | |
| 3 | Forklift teeth | Aluminium sheet 8x4cm | 1m |
| | | Aluminium fabrication | |

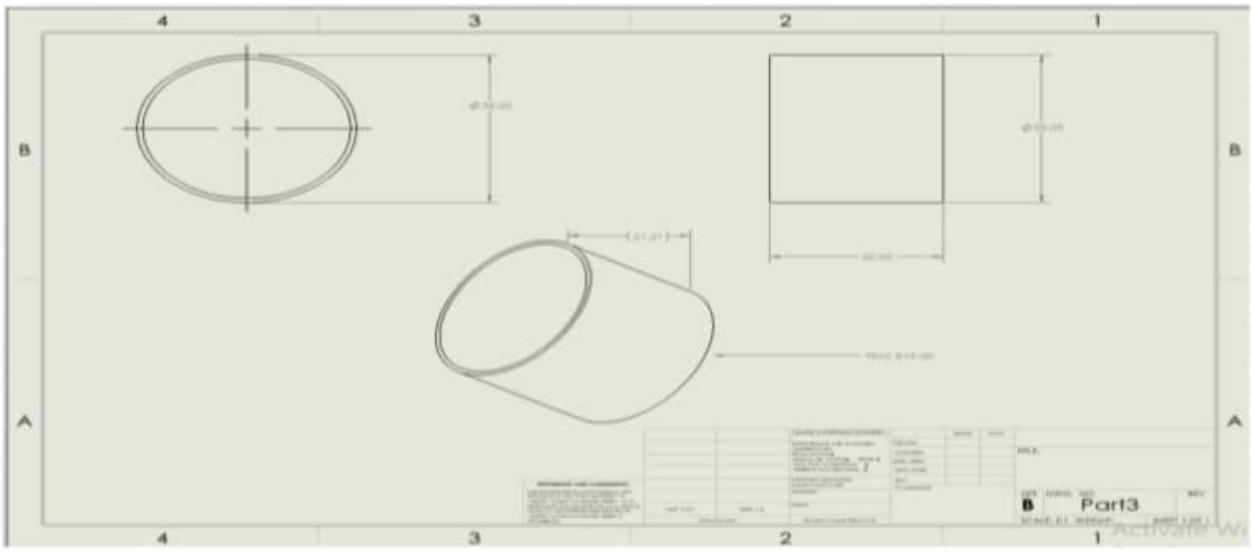


**FIG 4.2.1 CAD Drawing**

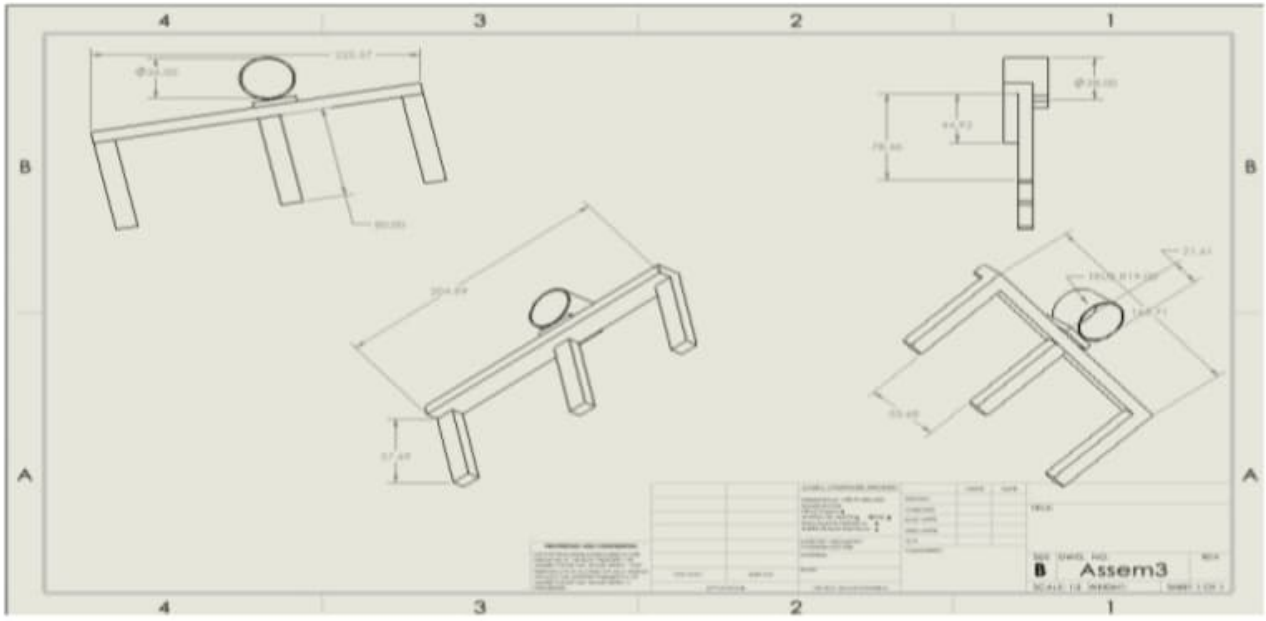


**FIG 4.2.2 CAD DRAWING**

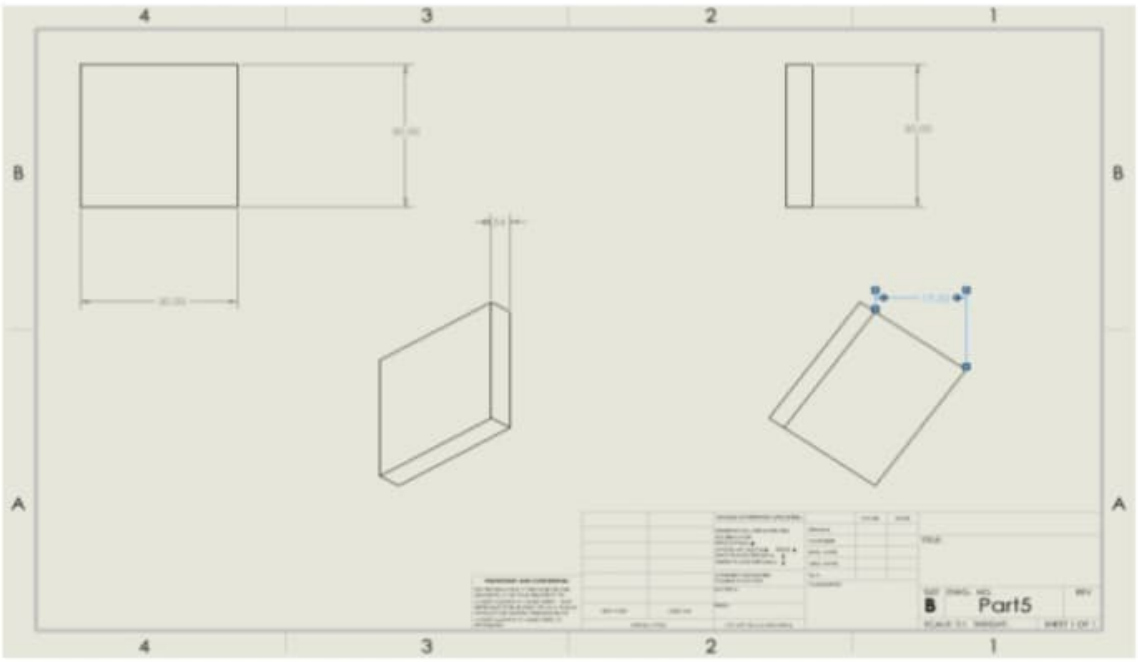


**FIG 4.2.3 CAD DRAWING**

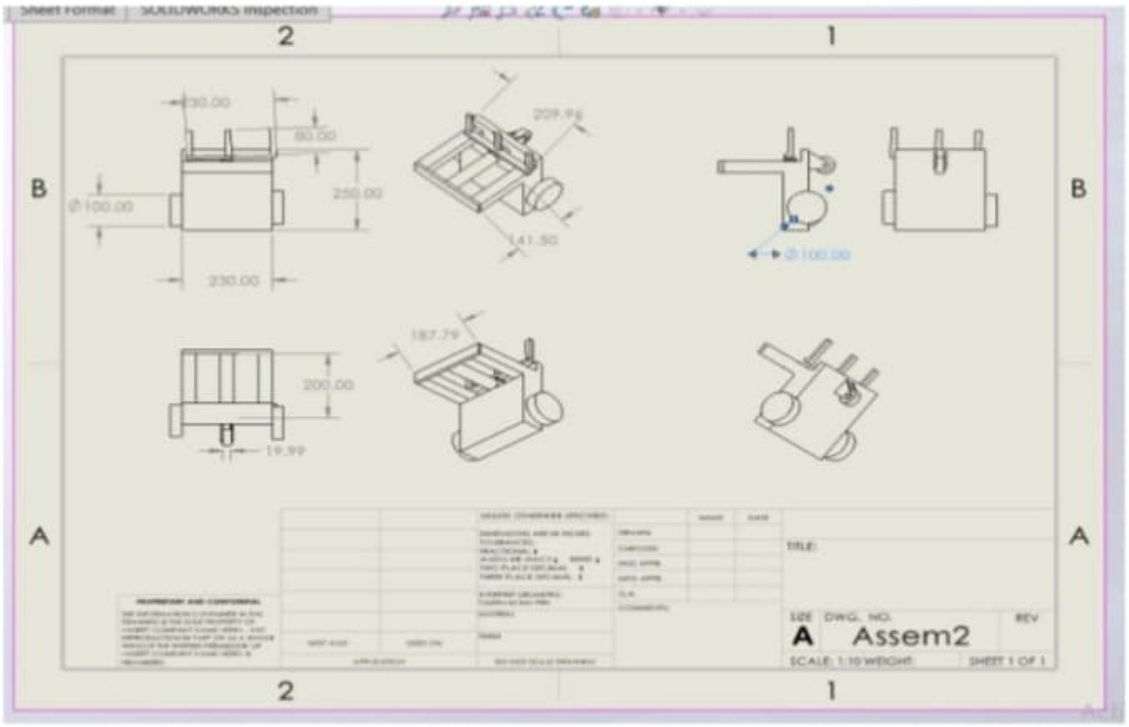


**FIG 4.2.4 CAD DRAWING**