ESP32 Robot Motor Control Assignment (Function-Based Control)

📌 Assignment Overview

In this assignment, students will design a **function-based motor control system** for a mobile robot using an **ESP32**.
Instead of writing motor logic repeatedly inside `loop()`, students must implement a **single reusable function** called `move()` that controls the robot's motion.

This assignment focuses on:

- Function abstraction
- PWM motor speed control
- Direction control
- Clean and scalable code design

🎯 Learning Outcomes

By completing this assignment, students will be able to:

- Control DC motors using ESP32 PWM (LEDC)
- Write reusable motor-control functions
- Control a 4-motor robot using a single function
- Understand how direction and speed are abstracted in robotics software

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🔧 Hardware Assumptions

- ESP32
- Motor driver (L298N / TB6612 / equivalent)
- 4 DC motors
- External motor power supply

Task 1: Motor Control Function

You must implement the following function:

```
void move(int speed, String direction);
```

Function Parameters

- `speed`
  - Range: `0 - 255`
  - Controls the PWM speed of the motors
- `direction`
  - One of the following strings:
    - `"Forward"`
    - `"Backward"`
    - `"Rotate_Left"`
    - `"Rotate_Right"`
    - `"Stop"`

Task 2: Direction Logic (Required)

Inside the `move()` function, implement logic for **all four motors**:

Direction Behavior

Direction	Motor Behavior
Forward	All motors forward
Backward	All motors backward
Rotate_Left	Left motors backward, right motors forward
Rotate_Right	Left motors forward, right motors backward
Stop	All motors stopped

Task 3: Setup Requirements

In `setup()`:

- Configure all motor direction pins as `OUTPUT`
- Configure **4 PWM channels** using `ledcSetup()`

- Attach PWM channels to motor enable pins using `ledcAttachPin()`

Task 4: Required Robot Test Sequence

Your robot **must execute the following sequence inside `loop()`**:

```
move(50, "Forward");
delay(2000);

move(50, "Rotate_Right");
delay(2000);

move(50, "Forward");
delay(3000);

move(50, "Rotate_Left");
delay(2000);

move(50, "Backward");
delay(4000);

move(0, "Stop");
delay(3000);
```

⚠️ **This exact sequence is mandatory**
Your robot should physically perform the movements in this order.

Task 5: Code Quality Requirements

Your code must:

- Use **only one movement function** (`move()`)
- Avoid repeating motor logic in `loop()`
- Be readable and well-commented
- Use meaningful variable names

Submission Instructions

Students must submit:

1. ☑ Arduino `.ino` file
2. ☑ GitHub repository with this README
3. ☑ Short explanation

4. ☑ youtube_link (Video Testing)
