

## Description:

Suppose you have a four-diving wheel robot, you are required to design the system so that the car moves in a rectangular shape.



Figure 1: 4WD Car

## Detailed Requirements

### 1. Create a backlog for the team

1. Create an excel sheet named **Team Backlog** that contains the below columns
  1. Task Name
  2. Assignee
  3. Task Status
  4. Expected time to finish
  5. Actual time to finish

### 2. Read System Requirement Specifications

#### 1. Car Components:

1. **Four** motors (M1, M2, M3, M4)
2. **One** button to start (PB1)
3. **One** button for stop (PB2)
4. **Four** LEDs (LED1, LED2, LED3, LED4)

#### 2. System Requirements:

1. The car **starts initially** from **0 speed**
2. When **PB1** is **pressed**, the car will **move forward after 1 second**
3. The car will move forward to **create the longest side of the rectangle for 3 seconds with 50% of its maximum speed**
4. After finishing the first longest side the car will **stop for 0.5 seconds, rotate 90 degrees to the right, and stop for 0.5 second**

5. The car will move to **create the short side** of the rectangle at **30% of its speed for 2 seconds**
6. After finishing the shortest side, the car will stop for **0.5 seconds**, **rotate 90 degrees to the right**, and **stop for 0.5 second**
7. Steps **3 to 6** will be **repeated infinitely** until you press the **stop button (PB2)**
8. **PB2** acts as a **sudden break**, and it has the highest priority
9. **LEDs Operations**
  1. **LED1**: On means moving forward on the long side
  2. **LED2**: On means moving forward on the short side
  3. **LED3**: On means stop
  4. **LED4**: On means Rotating

### 3. Prepare your design

1. Please note that any functionality based on timers should be separated in a separate module, and all timers should be operating in **Normal mode**
2. Create a PDF file with the name **Moving Car Design**
3. The design document should contain the below fields
  1. Cover Page
  2. Table of content
  3. Project introduction
  4. High Level Design
    1. Layered architecture
    2. Modules Descriptions
    3. Drivers' documentation
  5. Low Level Design
    1. Provide the flowchart for each function in each module

### 4. Preparing development environment

1. Create layer's folders
  1. Create a folder for each layer
  2. All folders should be in **upper case**
  3. Ex: **MCAL, HAL, APP**, ... etc
2. Create driver's folders and files
  1. Create a folder for each driver
    1. Each folder contains **only one .c** file and **at least one .h** file
    2. All files names should be in **lower case**
  2. All driver folders names should be in **lower case**
  3. Ex: **dio, timer, pwm**, ... etc.
3. Add header file guard
  1. All header files must include the header file guard

### 5. Drivers implementation and code convention

1. All drivers provided in the design document should be implemented
2. All drivers should be tested against different test cases
3. Function's descriptions should be included
4. Don't use magic numbers, use Macros or Enums instead
5. Follow a proper indentation in your code

6. Use a meaningful name for your variables
7. Follow the below naming for the functions
  1. MODULENAME\_functionName
8. Follow this convention for naming variables
  1. typeIndicator\_scopeIndicator\_variableName
  2. typeIndicators (u8, u16, u32, i8, i16, st (struct), en (enum), arr (array), .. etc)
  3. scopeIndicators (g (global), gs (global static), a (argument))
- 6. Implement and integrate the main application**
  1. Implement the main application that fulfil the system requirements
- 7. Test your application**
  1. Create an excel sheet named **Test Protocol**
  2. The sheet should contain the below columns
    1. Test Case ID
    2. Test Case Description
    3. Test Case steps
    4. Expected Result
    5. Actual Result
    6. Pass/Fail
  3. Fill in the sheet with the test cases you will execute
  4. Execute the test cases on **simulator (Mandatory)**
  5. Execute the test cases on **hardware (Optional)**

## Delivery

6. Deliver the Team Backlog sheet
7. Deliver the Design Document
8. Deliver all project files and folders including the .hex file
9. All code conventions must be followed
10. English Video recording presenting all of your work as a team
  1. The video should be 15 minutes maximum
  2. Each team member should present himself and discuss his role and what did he delivered through the backlog and what test strategy did he/she made to test his/her work
  3. Application testing should be presented by the team coordinator starting from the Test protocol sheet to simulator and/or the hardware
  4. Any limitation or failed test cases should be communicated in the video