



COMPUTER ENGINEERING



**UIT**  
TRƯỜNG ĐẠI HỌC  
CÔNG NGHỆ THÔNG TIN

# CE437 – CHUYÊN ĐỀ THIẾT KẾ HỆ THỐNG NHÚNG 1

## Lab Section Introduction

6/28/23



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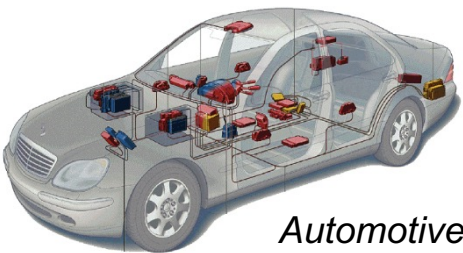
**Bosch**  
**Global**  
**Software**  
**Technologies**  
alt\_future



# System Overview:

## Car model:

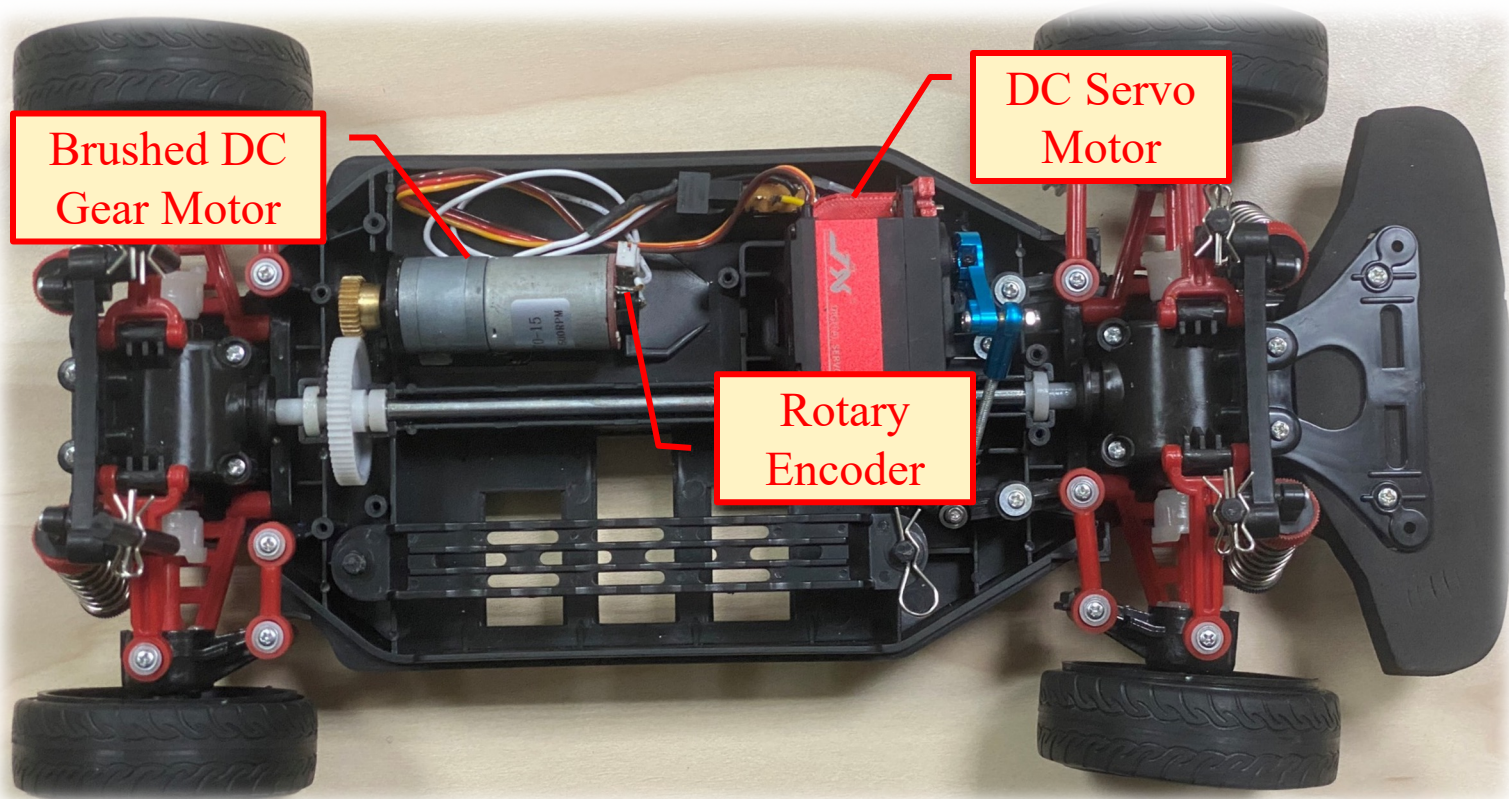
- Cyber + Physical
- Computation + Dynamics
- Security + Safety





# System Overview:

## Car model:

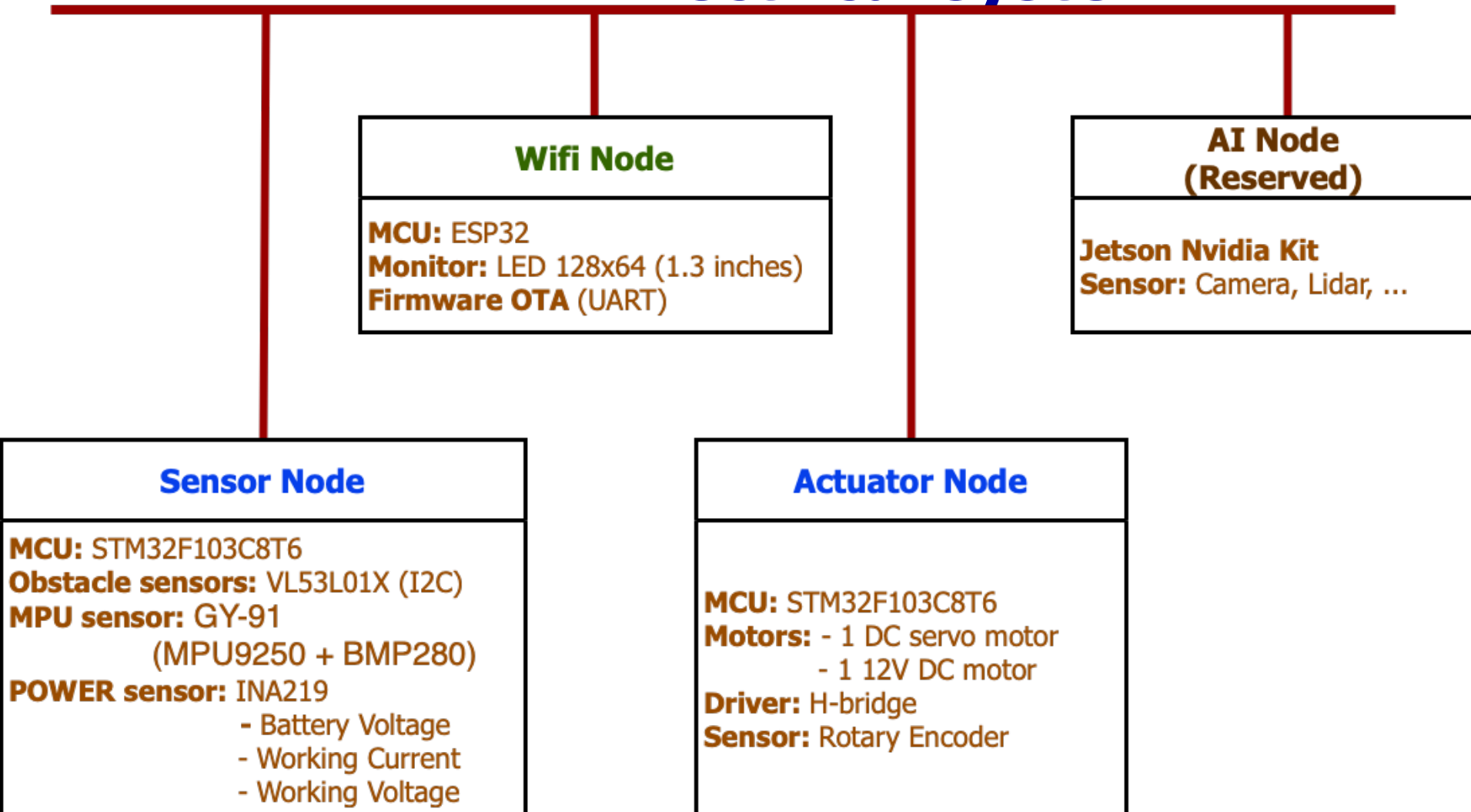




# System Overview:

CAN BUS

## Electrical system:

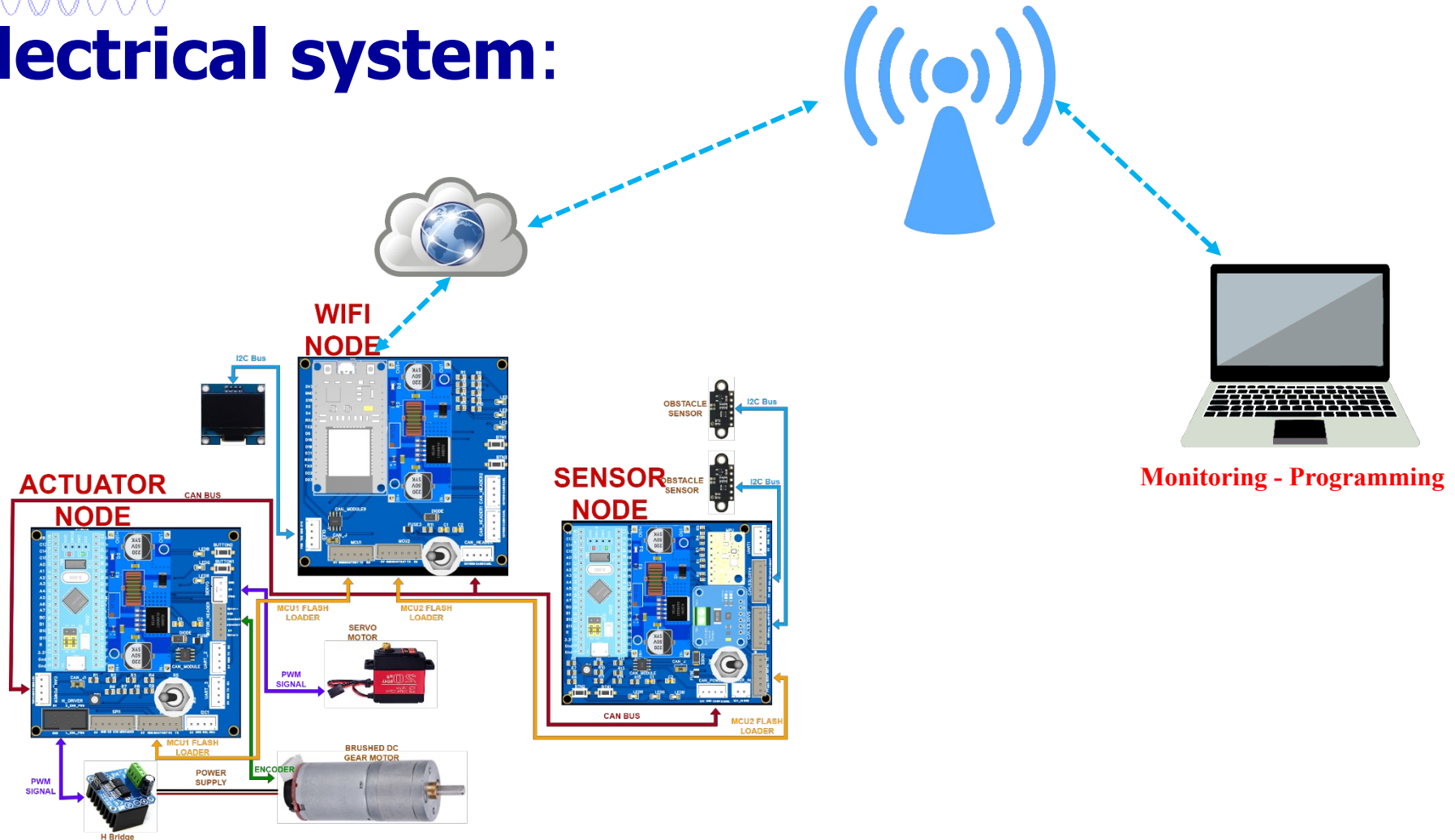






# System Overview:

## Electrical system:





# Electrical system:

**WIFI NODE:** works as the gateway of the whole system with all the tasks processed by an esp32 processor

## ESP32 functions:

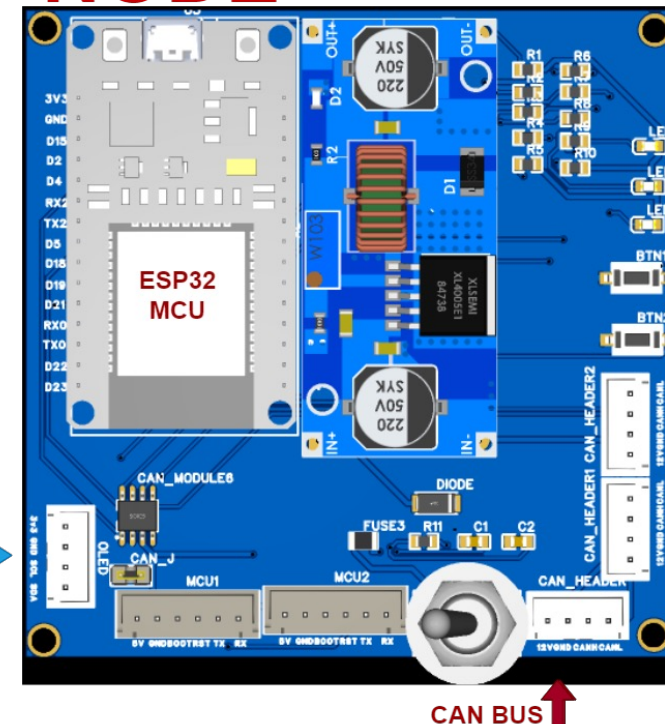
- Manage Wi-fi Connection
- Web-server
- Download the firmware to STM32 MCUs by UART bus
- Communicate with the other nodes by CAN BUS
- Display important data on OLED



## Connections:

- Wi-fi/Bluetooth 2.4GHz
- CAN
- UART

## WIFI NODE





# Electrical system:

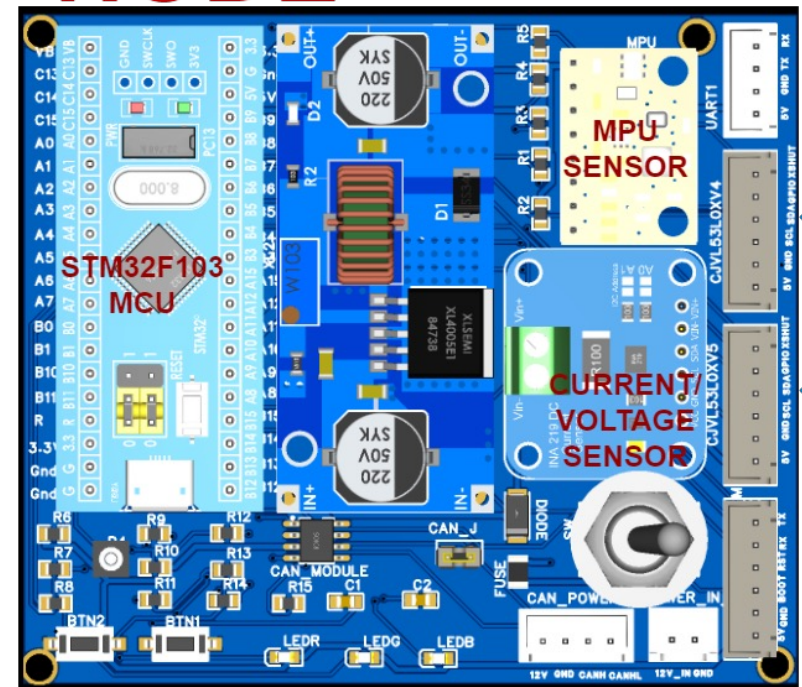
**SENSOR NODE:** has various types of sensors such as MPU sensor (including accelerometer, gyroscope), electric current and voltage sensor, and two obstacle sensors

Main processor: ARM Cortex-M3, STM32F103

**STM32F103 functions:**

- Collect sensors data by I2C bus
- Communicate with the other nodes by CAN BUS

**SENSOR NODE**



OBSTACLE  
SENSOR

I2C Bus

OBSTACLE  
SENSOR

I2C Bus

CAN BUS

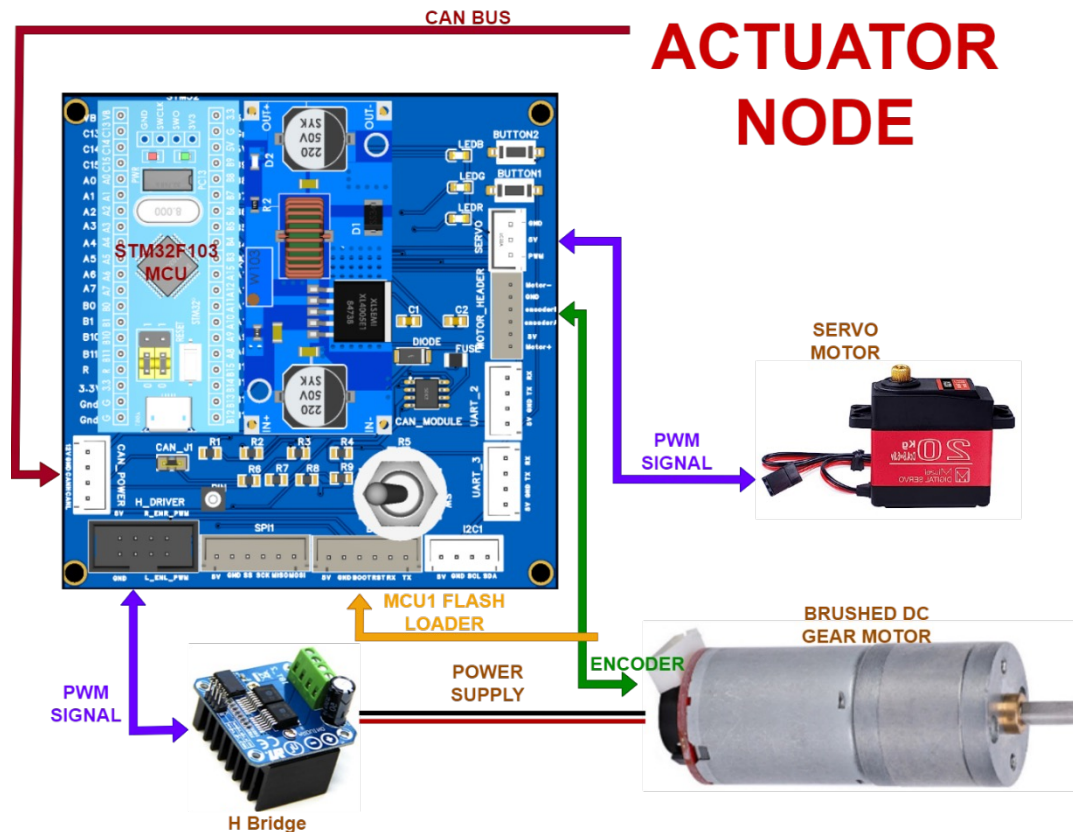
MCU2 FLASH  
LOADER



# Electrical system:

**ACTUATOR NODE:** controls a DC servo motor (steering angle) and a brushed DC gear motor

Main processor: ARM Cortex-M3, STM32F103





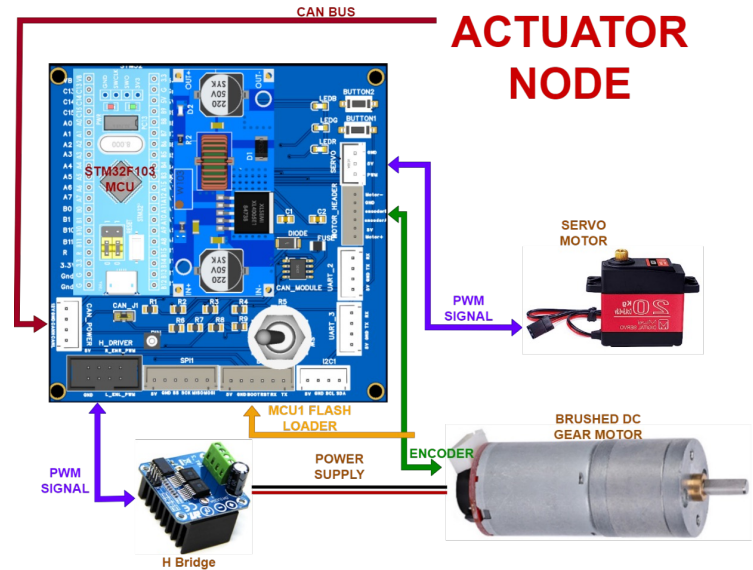


# Electrical system:

## ACTUATOR NODE:

### STM32F103 functions:

- Communicate with the other nodes by CAN BUS
- Create PWM signal to control DC servo motor
- Read rotary encoder from DC gear motor and create PWM signal to control its speed





# CE437- ESP32 Web-server:

## WIFI Management Page:

Wifi Config

Flash MCU

About

SSID:

UIT

Scan

Password:

IP Address:

0.0.0.0

Connect:

not connected

Submit



# CE437- ESP32 Web-server:

## STM32 Firmware OTA Page:

Wifi Config

Flash MCU

About

Upload STM32 BinFile

Choose File

no file selected

Upload

SPIFFS Storage : 1.26 MB

Used : 11.03 KB

List file

Run both

File to download:

1.First STM32 - running

Run

Download

Erase

2.Second STM32 - running

Run

Download

Erase



# CE437- ESP32 Web-server:

## About Page:

Wifi Config

Flash MCU

About

### CE437-Chuyên đề thiết kế hệ thống nhúng 1

Khoa Kỹ thuật Máy tính Trường Đại học Công nghệ Thông tin phối hợp cùng với công ty Bosch Global Software Technologies Việt Nam để tổ chức khóa đào tạo lập trình nhúng trong xe ô tô

Đến với khóa học, các bạn sẽ có cơ hội:

- Tích lũy kiến thức tổng quan và chuyên sâu về Lập trình Nhúng trong Ô tô
- Trải nghiệm các bài thực hành sát với thực tế thị trường ngành ô tô
- Được hướng dẫn bởi đội ngũ các chuyên gia kỹ thuật giàu kinh nghiệm tại Bosch





# Exercises:

## Automotive Functions:

- Design and implement CAN API
- Implement motor control ECU
- Implement safety functions: obstacle avoidance

## Extended Functions:

- Design and implement data monitoring page
- Design and implement UX/UI on OLED
- Implement security standards for OTA
- Research and implement security standards for CAN Bus



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# Q&A

