

# **PROJECT 3**

## **Automotive Door Control System Design**

### **Dynamic Design**

#### **Project Requirements**

##### **- Hardware requirements:**

- Two microcontrollers connected via CAN bus
- One Door sensor (D)
- One Light switch (L)
- One Speed sensor (S)
- ECU 1 connected to D, S, and L, all input devices
- Two lights, right (RL) and left (LL)
- One buzzer (B)
- ECU 2 connected to RL, LL, and B, all output devices

##### **- Software requirements:**

- ECU 1 will send status messages periodically to ECU 2 through the CAN protocol
- Status messages will be sent using Basic Communication Module (BCM)
- Door state message will be sent every 10ms to ECU 2
- Light switch state message will be sent every 20ms to ECU 2
- Speed state message will be sent every 5ms to ECU 2
- Each ECU will have an OS and application SW components
- If the door is opened while the car is moving → Buzzer ON, Lights OFF
- If the door is opened while the car is stopped → Buzzer OFF, Lights ON
- If the door is closed while the lights were ON → Lights are OFF after 3 seconds
- If the car is moving and the light switch is pressed → Buzzer OFF, Lights ON
- If the car is stopped and the light switch is pressed → Buzzer ON, Lights ON

You should draw and deliver the system schematic (Block Diagram) according to your requirements understanding, a screenshot is required

## **Dynamic Design Analysis**

- For ECU 1:

1. Draw a state machine diagram for each ECU component
2. Draw a state machine diagram for the ECU operation
3. Draw the sequence diagram for the ECU
4. Calculate CPU load for the ECU

- For ECU 2:

1. Draw a state machine diagram for each ECU component
2. Draw a state machine diagram for the ECU operation
3. Draw the sequence diagram for the ECU
4. Calculate CPU load for the ECU

Calculate bus load in your system: With what percentage of system bus was busy per 1 second

You should deliver a pdf file containing all your work and a video recording where you will discuss your work (maximum 5min long)