

Embedded Systems, Winter Semester 2020  
Project Submission Guidelines  
Deadline: 11/01/2021 11:59 pm

## 1 Features Constraints

The following notes are complementary to the **Project Description** document, and you need to refer to both of them in order to implement your project properly. The requirements are divided between the Project Description and the Project Guidelines documents.

### FreeRTOS

- a) You must divide your system into schedulable tasks.
  - 1. It is not a must to represent a whole feature as a single task.
  - 2. A task may contain multiple elements from different features.
- b) All features must work together without any user intervention.
- c) You need to prioritize the tasks in a way that ensures the system is working properly.
- d) Some features' elements may be implemented using interrupts instead of adding them to tasks.

### 1.1 Lane Keeping Assist (LKA)

- a) The lane may be represented as a single line where the car is moving on it, or as two lines where the car is moving in between them.
- b) The car **MUST MOVE** using the motors and Pulse Width Modulation (**PWM**).
- c) Altering the driver using either a visual warning as a LED, or an audible warning as a buzzer.
- d) The car **MUST** return back to the lane if it drifts right or left.

### 1.2 Active Parking Assist (APA)

- a) The car **MUST MOVE** using the motors and Pulse Width Modulation (**PWM**).
- b) The car **MUST** park parallelly between two static objects using one or more ultrasonic sensors, to prevent it from colliding with the static objects.
- c) The audible warning should be represented as a buzzer where the tone changes based on the distance between the car and the static object.

### 1.3 Control Indicators (CI)

- a) The current gear **may not** be reflected on the car movement.
- b) It is required to change the gear using a physical joystick.
- c) The current gear must be displayed on a 7-Segment display or the touchscreen.
- d) You need to change the light intensity of the car headlights according to the light intensity sensor reading, which can be represented as a single LED, or a group of LEDs.

### 1.4 Fluids Indicators (FI)

- a) The rain detection and the fuel level detection must use independent sensors.
- b) The windshields are simulated using one servo motor in two directions according to the rain detection sensor reading.
- c) The fuel level must be displayed on a 7-Segment display or the touchscreen.

### 1.5 Radio System (RS)

- a) You must control the radio system using the touchscreen only.
- b) The items needed to be available on the touchscreen are present in the Project Description document.
- c) Your system must tune to at least three radio channels.

### 1.6 Sound System (SS)

- a) You must use any external speaker to output sound.
- b) You must control the sound system using the touchscreen only.
- c) The items needed to be available on the touchscreen are present in the Project Description document.
- d) The Next and Previous buttons must not work if no sound is being played.
- e) Your system must have at least three playable songs on the SD card.

## 2 Report

The report should include the following items:

- a) A cover page containing the team number, name, and members information.
- b) Brief description about your project idea and approach.
- c) The components used in your project and their functionalities.
- d) The project full circuit using Fritzing <https://fritzing.org/home/>
- e) The names of the libraries used and their functions.
- f) How do you take and handle the inputs?
- g) How do you configure and handle the outputs?
- h) Explain how the features were prioritized and divided into tasks using freeRTOS
- i) The problems or limitations faced during the implementation of your project.
- j) How did you divide the work among the team members?

The report should be named in the following format: [TeamNumber]\_[TeamName]

**Note:** Part of the project report grade will be allocated on sentence structure and flow, grammar, the neatness of the report, and whether it includes all the requirements or not.

## 3 Submission

You should submit a ZIP file to the course e-mail containing the following items:

- The main/source code (.ino).
- Any additional code file used.
- Any external library file used.
- The project report in PDF format.

**E-Mail:** [csen701w20@gmail.com](mailto:csen701w20@gmail.com)

The ZIP file should be named in the following format: [TeamNumber]\_[TeamName]

**Submission Deadline:** Monday 11/01/2021 11:59 pm.

## 4 YouTube Video

You should create a 5-10 minutes YouTube video in English demonstrating the functionalities of the project, where each student will have 2-3 minutes presenting their part.

The video should include a full working demo for your project **at the beginning of the video.**

Each student contribution in the project must be stated clearly during their part.

You will upload the video on the course channel with the following format:

"TeamName TeamNumber FeaturesNames "

FeaturesNames = [LKA, APA, CI, FI, RS, SS]

**Account:** embeddedssystemsguc2020@gmail.com

**Password:** alwaysrefertothedatasheet

**Channel:** <https://www.youtube.com/channel/UC5UljDApstnPXaVSoWsipqw/>

**Video Deadline:** Thursday 14/01/2021 11:59 pm (*For the YouTube video only!*)

**Note:** Students who will not appear in the video will receive a **ZERO** in the entire project!

## 5 Evaluation

The evaluations will take place starting from Tuesday 12/01/2021.

- The entire team must show up to the evaluation on time.
- Students who won't attend the evaluation will receive a **ZERO** in the project.
- Each student will be asked in the part they contributed to in the project.
- You will run a live demo of the project during the evaluation, so bring the physical project with you.
- Bring a hard copy of the project report with you to the evaluation.

**Note:** The evaluation slot reservation form will be sent via e-mail.