

Embedded Systems, Winter Semester 2022
Project Submission Guidelines
Deadline: 30/12/2022 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.

This document consists of 6 sections, read them all carefully.

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 should be represented 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) Alerting 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 rain wipers 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 Tips

1. You can buy your hardware components from:
 - Future Electronics <https://store.fut-electronics.com/>
 - Ram Electronics <https://ram-e-shop.com/>
 - Maamoun Electronics <https://www.maamoon.com/>
 - Amazon amazon.eg
2. You can find on amazon packs of components that can be cheaper than buying individual components. So you can share a pack with other teams.
3. Try buying components as soon as possible once you are assigned to the features to be able to start assembling your project.

3 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: [Team Number][Features Names]

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.

4 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: `csen701w22@gmail.com`

The ZIP file should be named in the following format: [Team Number][Features Names]

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5 Evaluation

The evaluations will take place in the revision week.

- 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.