

Innovative Design Guide



The Art of Lights

1. Introduction

Innovative Design is the modality where participants combine their creativity and knowledge to develop new technological designs, or improve existing designs. Their solution should take into account the technical, social, environmental and economic impact of their design. In short, this category aims at the development of a concept/prototype of a new technological invention and its respective market development plan.

On the roads there are multiple types of lights for signaling and illumination. The most important signaling function is the direction indicator, that signals the intention of a driver to turn direction. Due to the importance of this function, it must have an audio signal that gives feedback to the driver on its well function. It also must have visual feedback on the cockpit, through a green LED, synchronized with the audio signal. When turning, it is important to have illumination on the direction of the turn, function done by the cornering lamp. The turn indicator signal is initiated by a switch lever controlled by the driver. The cornering lamp is automatically switched on accordingly the steering wheel (rotation angle).

2. Goals

2.1 MAIN GOAL

With the materials provided, build a functional prototype of a car cockpit that controls the lamps (direction indicator and cornering lamps).

2.1.1 GUIDELINES AND RULES TO ACHIEVE THE MAIN GOAL

Creation of the cockpit (installation of the lamps, steering wheel, lever, buzzer and LED feedback.

1. Switch on the direction indicator when the actuation of a switch/lever (function must switch with 0.5s ON / 0.5s OFF)
2. Give an audio signal that gives feedback to driver on its well function when the turn indicator is activated (LEDs must be monitored, audio signal must double frequency in case of failure of LEDs)
3. Give a visual signal that gives feedback to driver on its well function synchronized with the audio (a LED on cockpit)
4. Switch on the cornering lamp when the steering wheel is rotated (oo no function / 200 1 LED / 400 2 LED / 600 3 LED)

Note: You're allowed to add more functionalities and not only restrict yourself to the phases that were asked. That will be taken into account in the Originality criteria.

2.1.2 GENERAL RULES AND OBSERVATIONS

- Help from outside the team and the competition is strictly forbidden;
- Please respect the schedule. You are able to work on your task during the given time;
- Clean your working space after the competition;
- **Any question regarding the task has to be asked to Topic Group members;**
- Do not damage or destroy the tools you are given;
- In case of a damaged tool, contact the Topic Group immediately;
- Be extremely careful when using power equipment and/or sharp tools. In case of any doubt regarding these tools please refer to an organiser for help;
- Tools should be used for their designed purpose only;
- In case of injury or emergency, contact an organiser immediately;
- You can only use materials that were given to you in the Welcome Kit and those you bought in the EBEC Store. Mind that some objects from the Welcome Kit cannot be used in the prototype. More information is in the Appendix (Section 7);
- At the end of the competition, you have to transport your prototype to a room indicated by the organisers;
- You can only leave after calling Topic Group and be allowed to;
- Fire and water are not allowed.

3. Evaluation

The evaluation of the objective criteria (O) is based upon the presence or absence of certain characteristics. Each criteria has a score assigned that will be determined by the jury upon evaluation in a total of 20 points for these criteria. After this, all scores will be added and the final number for the objective criteria will be inserted in the final formula.

3.3 Objective Criteria(O)

The final formula is:

$$O = A + B + C$$

- **A - Construction of the cockpit - 5 points**

- Construction of the cockpit - 20%
 - Construction of the main structure and implementation of the lamps, steering wheel, buzzer, and LED - 60%
 - Construction of the main structure and implementation of the lamps, steering wheel, buzzer, and LED (Without any visible electrical part - 100 %
- **B - Switch indicator - 8 points**
 - Can turn the lights of the indicators - 10%
 - The lights blink 0.5 seconds - 20%
 - The blink is accompanied by the sound - 40%
 - The led shows that the blinker is working properly - 40%
 - The led blinks simultaneously with the switch indicator - 60%
 - The led blinks simultaneously with the switch indicator and the sound. - 100%
- **C - Adaptive cornering lights - 7 points**
 - Can turn on the lights- 20%
 - The 2nd light from each side is turned when the steering wheel deviates 30° from the initial position - 60%
 - The 3rd light from each side is turned when the steering wheel deviates 60° from the initial position- 100%

Note: In case of doubt about the criteria, the judges are the ones with the final word.

3.3 SUBJECTIVE CRITERIA (S)

The jury members will assign a score on a scale from 0 to 20 points and the score of each criterion will result from the average scores assigned by each jury. The final score will result from the average of the values assigned to each subjective criteria, which will be:

- Design (10%);
- Creativity and originality (45%);
- Functionality (45%).

3.4 REPORT AND PRESENTATION (RP)

Each team leader has to send the presentation and the report with the outcomes by email to the Topic Responsible (jose.silva@best-eu.org) and to the Main Organiser (diogo.ferreira@best-eu.org) **before the end of the 24 hours** with the following subject: [ID_Presentation_“team name”] & [ID_Report_“team name”]. The presentation and report are **mandatory. Failing to deliver these documents will immediately disqualify the team.** For the penalties that you may receive if you fail to deliver in time **you must check Section 6.** The jury members will assign a score on a scale from 0 to 20 points and the score of each criterion will result from the average scores assigned by each jury.

Presentation (P) - 50%

An engineer must not only know how to build but also know how to sell their product. The team must do a presentation showing the prototype and explain the solution adopted for the prototype. **The presentation must be in English and shouldn't take longer than 5 min.** Before the prototype presentation, the team is allowed to have 5 minutes of tests. Once the presentation begins, each team will have two tries.

Report (R) - 50%

Each team has to write a report (in English) to deliver at the end of the 24 hours. In the report you must not forget to answer the theoretical matter asked during the guide. It's important that, if you add some additional functionalities to your prototype, besides the ones which were requested, you must explain them too. It has to be a **Powerpoint**, with no more than 7 slides, explaining the strategy, the prototype construction, technical references, engineering concepts, adopted solutions and any other important information that the team finds relevant for the jury to evaluate.

3.5 FINAL SCORE AND FORMULAS

The following formula below will be used to calculate the final score (FS) of each team, where O, S and RP are the individual scores from the objective criteria, subjective criteria and the report and presentation, respectively.

$$FS = 0.60 * O + 0.25 * S + 0.15 * RP$$

4. Contacts

- Main Organiser EBEC Challenge Aveiro 2023: **Diogo Matos** - +351 969890949.
- Topic Responsible EBEC Challenge Aveiro 2023: **José Silva** - +351 918311076.

5. Penalties

- At the end of the competition you must deliver the prototype, the report and presentation; if you are late, **for each 5 minutes, your score will depreciate 1 value. After 21 min you will be disqualified.**

6. Appendix

Note that there are materials (tools included) that can't be used as part of your prototype, otherwise **you will lose your deposit!!!**

Category	Materials	Quantity	Can it be used in the prototype?
Welcome kit	<i>Ruler</i>	1	Tool
	<i>Hot glue gun</i>	1	Tool
	<i>Hot glue</i>	1	Yes
	<i>Pliers</i>	1	Tool
	<i>Tape measure</i>	1	Tool
	<i>Saw</i>	1	Tool
	<i>X-acto knife</i>	1	Tool
	<i>Big tape</i>	1	Yes
	<i>Sand Paper</i>	1	Tool
	<i>Hammer</i>	1	Tool
	White Led	8	Part
	Orange Led	2	Part
	Green Led	2	Part
	Buzzer	1	Part

Notes:

- At the end of the competition, these objects must be left in your room: script, pencils, pens, eraser, leftover post-its and every tool;
- Anything bought in EBEC's store cannot be taken home.