Objective

Apply the concepts and skills acquired during the course to propose, design, build, and test a prototype of an IoT embedded system based on Arduino, considering technical, economic, and ethical aspects in the processes of design and development.

General Guidelines

- Projects will be self-defined and individual. However, we encourage "joint" projects where each project interacts with others (maybe 1-3 others) to form a bigger system.
- Your project proposal and later design changes must be approved by the teaching team.
- The embedded system must depend on the microcontroller(s) included in the kit (Arduino/TTGO). However, integration with other development boards may be accepted upon pre-approval of the teaching team.
- Additional components will be available to students on demand. Check Moodle for the complete list of extra components available in the lab.
- Students are responsible for providing any component needed for their final project when it is not included in the basic kit nor in the list of extra components. It is the student's responsibility to ensure that extra components purchased for the project arrive on time according to the course schedule and deadlines.

Project Proposal

- Prepare and submit a 1-page document that describes your project idea. The document must include the following sections:

    o Problem: description of the problem you are trying to solve with your system.

    o Proposed Solution: description of the proposed system. You should consider the following aspects in the design of your solution:
        ✓ The embedded system uses input/output data from/to sensors/actuators (different from LEDs), or both.
        ✓ The embedded system uses an Arduino microcontroller, or a TTGO (if the latter suffices the technical requirements), or both.
        ✓ The embedded device connects to the Internet using a wireless

technology (e.g., WiFi or LoRa).

- ✓ The application designed for the embedded system is distributed and involves a server on the Internet or a cloud-based platform for decision-making tasks. The application messages travel in both directions (uplink and downlink).
- ✓ The embedded device provides a user interface to confirm it is working properly. Examples of user interfaces are a web page, an LCD display, etc.
- ✓ Two or more embedded devices may connect using a wireless local technology (e.g., Bluetooth or ZigBee)

- o <u>Initial Design</u>: functional block diagram and preliminary list of the required hardware.

Note 1: Check the Project's Rubric for a detailed list of the aspects we expect to see in final projects.

Note 2: The proposal will be discussed on week 6 with the teaching team for approval.

Project Check-in

- Submit a 1-page document that describes what has been done so far. The report should list the tasks needed in the project, with an identification of tasks completed and tasks pending. It is expected that you show about 1/3 of progress in your project by the check-in date.
- If necessary, include an extra page to list changes made with respect to the original proposal/design. Discuss these changes with the teaching team for approval.
- Show what you have implemented so far to the teaching team during the lab session of week 9.

Project Demonstration

- Give a 5-minute presentation to explain your project. The presentation must be accompanied by 3 slides: (1) main problem and proposed solution, (2) functional block diagram or high-level schematic hardware diagram, and (3) design assessment.
- The design assessment must include your reflections regarding: reliability of the solution, cost, safety considerations, security considerations, and ethical considerations.
- Give a 5-minute live demonstration of your system. Make sure to showcase all the functionalities during the allocated time.
- Provide a link to a 5-minute video that showcases your system working.

Note: For reasons of fairness, all groups must upload the final version of the source codes on the same date. At the time of demonstrations, students will use the source code downloaded directly from Moodle to ensure they are using the submitted version of the code.

Important Dates

- Project proposal (1-page): **Oct 18th, 2023 at 5:30 pm**
- Project check-in (1-page + 1-optional page). **November 7th, 2023 at noon**
- Source code files and link to video. **Dec 5th, 2023 at 11:59 pm**
- Presentation file. **Dec 8th, 2023 at 11:59 pm**
- In-person demonstration of the final prototype. **Dec 6-8th, 2023.** More details will be posted in Moodle.