

Title:

## **Introduction to Physical Computing with Arduinos**

### Scope

This course was developed to meet the growing need for teacher training in STEAM fields, providing a set of tools and emerging technologies based on programming and physical computing with Arduinos. It enables the enrichment of the traditional curriculum and pedagogical practices, fostering creativity, critical thinking and collaboration among participants.

In line with this, the present proposal for the Microcredential Course is hereby submitted for approval. The course is worth 2 ECTS credits, corresponding to a total workload of 54 hours, including 18 hours of face-to-face classes, 9 hours of synchronous sessions and the remaining hours dedicated to self-directed work.

### Context

The training of professionals in the STEAM fields (Science, Technology, Engineering, Arts, and Mathematics) is considered essential to meet the growing demands of an increasingly technological and interconnected world. Teacher training in STEAM is essential to inspire and prepare future generations of students, equipping them with the skills needed to solve complex problems and drive meaningful progress across diverse fields. The physical computing programming with Arduino proposed in this course offers an accessible and versatile platform for teaching complex concepts in a simple, practical, and interactive way. It promotes active learning and makes the learning process more engaging, aiming to enhance students' skills and competencies.

### Target Audience

Teachers in the fields of Science, Technology, Engineering, Arts and Mathematics, as well as educators from any other discipline, ranging from secondary to vocational education, adult education, and special needs.

### Student Places

The minimum number of places is ten (10) and the maximum is twenty-five (25).

### Course Schedule

The course is divided into 6 weeks, with a total of 54 hours, including 18 hours of face-to-face classes and 9 hours of synchronous sessions, with the remaining hours allocated to self-directed work.

### Course Structure

#### Week 1:

- Introduction to physical computing and the Arduino platform
- Introduction to Arduino and the development environment
- First steps with Arduino

Experimental assignment: Spaceship LED panel

#### Week 2:

- The Arduino programming language.
- Interfaces with the external world - digital and analogue EIS sensors. Sound, light, temperature, and humidity project. Serial communication.

Experimental assignment: Measuring body temperature and tricolour LEDs or implementing a musical keyboard.

#### Week 3:

- Arduino in motion — Controlling a DC motor using PWM

Experimental assignment: Measuring body temperature

#### Week 4:

- Actuators and Interactivity.
- Project using sonars, LCDs, and servos.

Experimental assignment: Build a crystal ball using an LCD.

#### Weeks 5 and 6:

STEAM project to be defined by the instructor or by the participant (individual).

### Assessment Method

Each participant will prepare a critical report on the work carried out and its relevance to student motivation, learning improvement and overall development. Additionally, an assignment will be organised with support from the instructor, involving the creation of materials for direct use with students on one of the course topics.

Final assessment:

- Attendance in at least two-thirds of the face-to-face sessions.
- Weighting: 25% for participation in sessions and 75% for the assignments and final report prepared by the participant.