MOBILITY FRIENDS TRAINING CENTER • COURSE PROGRAM

STEM AND TECHNOLOGICAL INNOVATION

Technology, Robotics and Engineering

ROBOTICS IN PRACTICE: PROGRAMMING AND BUILDING SMART SYSTEMS

Your Mobility Partner

PIC Number: 948037649 | **Organisation ID:** E10207576

COURSE OVERVIEW

Robotics in Practice offers a hands-on introduction to the world of physical computing and intelligent systems through the use of Arduino-based robotics kits. Participants will learn how to design, assemble and program simple robotic systems that respond to their environment. Using a range of sensors, actuators and microcontrollers, the course introduces the key principles of robotics — including inputs, outputs, control structures and embedded logic — in a highly practical and accessible way. Throughout the course, learners will develop small-scale systems such as obstacle-avoiding robots, light sensors, or line-following vehicles. The programme combines basic electronics, structured programming and creative problem-solving, culminating in a final project where participants build and present their own smart robotic solution.

TARGET AUDIENCE

This course is intended for participants interested in understanding and exploring the fundamentals of robotics by building physical systems and programming microcontrollers using Arduino-based kits. It is especially suited for individuals who enjoy working with technology in a hands-on way, combining electronic components with logical thinking to create interactive and automated solutions. Participants will engage with sensors, actuators, and basic programming structures through an applied, project-oriented approach. The course is ideal for those seeking a structured and practical introduction to robotics, with a focus on problem-solving, creativity, and active learning.

REQUIREMENTS

To take part in the course, participants must meet the following requirements:

- Have at least a B1 level of English (independent user);
- Complete and submit the registration form before the start of the training;
- Bring a laptop or tablet to use during the sessions;
- Commit to active participation and attend at least 80% of the course.

COURSE OBJECTIVES

The objectives of the course are:

- Understand the fundamental principles of robotics and automated systems.
- Learn how to build simple circuits using sensors, motors and other electronic components.
- Program Arduino microcontrollers to control physical inputs and outputs using structured logic.
- Apply knowledge of electronics and coding to create interactive and autonomous systems.
- Develop a functional final project that integrates the key concepts and skills acquired during the course.

CONTACTS AND REGISTRATION

For registrations, additional information, or budget requests, please contact our team by email at trainingcourses@mobilityfriends.org or visit our website at www.mobilityfriends.org .

LEARNING OUTCOMES

Upon successful completion of this course, learners will be able to:

1. Describe the basic components and structure of a robotic system.
2. Assemble and connect simple electronic circuits using Arduino-compatible components.
3. Write and upload structured Arduino code to control actuators and read sensor input.
4. Implement basic control logic (conditions, loops, timing) in microcontroller-based systems.
5. Test and troubleshoot hardware and code to ensure correct system behaviour.
6. Design and build a small, functional robot that performs a defined task.
7. Document and explain the functioning of their robotic system to others.
8. Reflect on the potential applications of robotics in everyday life and different industries.

METHODOLOGY

The course is structured around a rigorous methodology that combines theoretical exposition, practical work, and applied demonstrations. This approach ensures a thorough understanding of the subject matter and its direct application in real-world contexts.

Theoretical sessions provide essential foundations, while practical work and demonstrations facilitate the development of technical skills and familiarity with the specific tools and procedures relevant to the course.

Continuous monitoring through individualized feedback allows for tracking learners' progress and ensures the achievement of the set objectives, preparing participants to face professional challenges with competence and precision.

ASSESSMENT

Assessment is carried out continuously throughout the course, using a holistic and learner-centered approach that reflects both participation and performance. Each participant is evaluated based on their overall engagement, regular attendance, punctuality, interest in the topics covered, ability to apply knowledge during practical tasks, and interaction with peers in individual and group activities.

The evaluation process includes a variety of classroom-based tasks (oral and written), short daily assignments, role-plays, and simulations. Trainers provide ongoing, individualized feedback to support progress and encourage active learning.

A Certificate of Participation is awarded to participants who attend at least 80% of the sessions and demonstrate consistent involvement and commitment during the training.

DURATION

The standard duration of our course is 20 hours (5 days), designed to ensure comprehensive and effective learning. However, this duration can be adjusted, in specific cases, to meet the particular needs of each group, in order to optimize outcomes and better suit the training context.
For further details or to discuss a customized schedule, please get in touch with us.

PRICE AND FUNDING

Each quotation is personalized and depends on several factors, such as the number of participants, the number of training hours, the location of the course, and any additional services requested (accommodation, transport, meals, cultural activities, etc.).
To receive a tailored quotation for your group, please get in touch with us.
The training can be funded through programs such as Erasmus+ (KA1 – Learning Mobility), among other European support mechanisms. For more information about funding, participants should contact their sending organization or their country's National Agency directly.

LOCATION AND COURSE LANGUAGE

We have training rooms in several cities in Mainland Portugal, such as Barcelos (headquarters), Braga, Póvoa de Varzim, and Porto. We also have spaces in the islands of Madeira (Funchal) and the Azores (Ponta Delgada). Additionally, we have facilities in Valencia, Spain.
The course is delivered in English.

CERTIFICATION

A Certificate of Participation is awarded to participants who attend at least 80% of the sessions and demonstrate consistent engagement and commitment throughout the training. Upon completion of the course, a formal certification ceremony will take place, during which the certificates will be presented to the participants.

OTHER SERVICES

To enrich the training experience, Mobility Friends offers a range of additional services, subject to availability and additional cost, which can be arranged for individual participants or groups.
Services include:

- Accommodation in partner residences or hotels
- Meals (lunch and/or dinner)
- Transfers between the accommodation and the training room
- Airport transfers
- Cultural visits

All services are subject to availability and must be requested in advance. For more information and personalised quotes, please contact our team.

COURSE CONTENTS

MODULE 1: INTRODUCTION TO ROBOTICS AND ARDUINO

- What is a robotic system? Key concepts: sensors, actuators, control.
- Differences between robotics, automation, and physical computing.
- Overview of the Arduino platform: components, capabilities, and uses.
- Setting up the Arduino IDE and connecting the board.
- Writing and uploading your first sketch ("Blink" program).

MODULE 2: BASIC COMPONENTS AND CIRCUIT BUILDING

- Understanding input and output: digital vs analog
- Using LEDs, resistors, push buttons, and potentiometers
- Building circuits with a breadboard and jumper wires
- Reading digital inputs and writing outputs in code
- Simple interactive circuits (e.g. button-controlled LED, buzzer alert)

MODULE 3: PROGRAMMING LOGIC WITH ARDUINO

- Structure of an Arduino sketch: `setup()` and `loop()`.
- Variables, data types, and comments.
- Control structures: conditional statements (`if`, `else`), loops (`for`, `while`).
- Creating reusable code with functions.
- Timing and delays: using `delay()` vs `millis()` for non-blocking code.

MODULE 4: SENSORS AND INPUT-DRIVEN BEHAVIOUR

- Reading values from analog sensors (light, temperature, distance).
- Signal interpretation and calibration.
- Triggering outputs based on sensor data.
- Creating responsive systems based on environmental conditions.
- Guided projects: light-activated systems, motion alerts, basic automation.

*Please note that program content may be subject to change based on input from our trainers.

COURSE CONTENTS

MODULE 5: ACTUATORS AND MOVEMENT

- Introduction to actuators: servo motors, DC motors, motor drivers.
- Basic motor control with PWM (Pulse Width Modulation).
- Integrating sensor input with motion output.
- Programming simple behaviours: obstacle avoidance, directional control.
- Mini project: autonomous robot or motorised system.

MODULE 6: TESTING, DEBUGGING AND SYSTEM OPTIMIZATION

- Testing strategies for hardware and code.
- Common issues with circuits and microcontrollers.
- Debugging techniques in Arduino IDE (serial monitor, step testing).
- Optimising circuit layout and program structure.
- Preparing for the final project: system planning and prototyping.

MODULE 7: FINAL PROJECT - BUILDING A SMART ROBOTIC SYSTEM

- Selecting a challenge or task (e.g. line follower, smart alarm, reactive bot).
- Designing the circuit and control logic.
- Integrating multiple components: sensors, actuators, and code.
- Assembly, testing, and performance tuning.
- Final presentation and demonstration of each working system.

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