STEM AND TECHNOLOGICAL INNOVATION

Technology, Robotics and Engineering

PRACTICAL ELECTRONICS: SMART CIRCUITS AND PROGRAMMING

ENTIDADE FORMADORA CERTIFICADA

Your Mobility Partner

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

COURSE OVERVIEW

Electronics in Practice: Building and Programming Smart Circuits offers a hands-on introduction to the essential concepts and techniques of modern electronics. Through interactive sessions and guided projects, participants will learn how to design, assemble, and test a variety of electronic circuits that respond intelligently to their environment, using key components such as resistors, capacitors, transistors, and sensors. The course primarily focuses on practical circuit construction and real-world applications, while also providing an optional introduction to programmable elements, such as microcontrollers, to enable the development of simple smart functions in electronic systems. Participants will develop problem-solving skills and gain the confidence to create functional and innovative electronic solutions.

TARGET AUDIENCE

This course is intended for participants interested in understanding and exploring the fundamentals of electronic circuits through practical, hands-on activities. It is particularly suited to those who enjoy working with technology, combining theoretical knowledge with practical application to create interactive and functional electronic systems. No advanced technical background is required, making it ideal for anyone wishing to develop essential skills in circuit assembly, component analysis, and basic programming for smart systems.

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 electronics and the basic operation of key electronic components.
- Identify and correctly use resistors, capacitors, transistors, diodes, sensors, and other essential elements in electronic circuits.
- Interpret simple electronic schematics and transfer them into practical assemblies using breadboards or prototyping boards.
- Build and test electronic circuits that respond to environmental stimuli, applying practical solutions to everyday situations.
- Apply basic diagnostic techniques to identify and resolve faults in electronic circuits.
- Develop small-scale electronics projects, individually or in groups, integrating sensors, actuators, and optionally, programmable elements.
- Gain autonomy and confidence to explore, modify, and create innovative electronic solutions tailored to different contexts and needs.

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 operation of electronic circuits.
2. Assemble and connect simple electronic circuits using breadboards and standard components.
3. Interpret and follow simple electronic schematics to build working prototypes.
4. Use measurement tools such as multimeters to test and troubleshoot electronic circuits.
5. Explain the function and practical applications of sensors and actuators in electronic systems.
6. Implement basic modifications to circuits to achieve specific behaviours or solve problems.
7. Apply safety principles when working with electronic components and systems.
8. Develop and present a small project that demonstrates the integration of multiple components and practical problem-solving.
9. Reflect on the role of electronics in modern technology and its potential applications in everyday life and industry.

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: FUNDAMENTALS OF ELECTRONICS

- Basic electrical concepts: current, voltage, resistance, power.
- Electronic components: resistors, capacitors, diodes, transistors.
- Circuit diagrams and symbols.
- Laboratory safety.
- Units of measurement and SI prefixes.

MODULE 2: CIRCUIT ASSEMBLY AND PROTOTYPING

- Using breadboards and protoboards.
- Series and parallel circuits.
- Switches and basic circuit protection (fuses, circuit breakers).
- Soldering basics (optional).
- Reading and following circuit diagrams.
- Practical exercise: LED circuit, buzzer circuit.

MODULE 3: POWER SOURCES AND POWER MANAGEMENT

- Types of power supplies: batteries, AC-DC adapters, USB power.
- Voltage regulators and power distribution.
- Safety with power sources.
- Building and testing simple power supply circuits.

MODULE 4: DIGITAL ELECTRONICS BASICS

- Introduction to digital vs. analogue signals.
- Logic gates: AND, OR, NOT.
- Simple combinational circuits.
- Application: digital counters, timers, basic logic puzzles.

MODULE 5: MEASUREMENT AND TROUBLESHOOTING TECHNIQUES

- Using multimeters: voltage, current, resistance, continuity.
- Using oscilloscopes (optional/introductory).
- Troubleshooting common circuit issues.
- Testing and verifying circuits.
- Diagnosing and repairing faults.

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

COURSE CONTENTS

MODULE 6: SENSORS, ACTUATORS, AND INTERACTIVE CIRCUITS

- Types of sensors: light, temperature, motion, humidity, etc.
- Actuators: buzzers, relays, motors, displays.
- Signal conditioning (basic filtering, amplification).
- Designing and building responsive circuits.
- Project: sensor-activated alarm, automatic fan, etc.

MODULE 7: SMART CIRCUITS WITH PROGRAMMABLE ELEMENTS (OPTIONAL)

- 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 8: STANDARDS, BEST PRACTICES, AND DOCUMENTATION

- International standards and symbols in electronics.
- Good practices for assembly, cabling, and layout.
- Documenting projects: schematics, parts lists, project logs.
- Ethics and safety in electronics.

MODULE 9: DIGITAL TOOLS AND SIMULATION (OPTIONAL/RECOMMENDED)

- Introduction to circuit simulation software (e.g., Tinkercad Circuits, Proteus, Fritzing).
- Simulating and testing circuits virtually.
- Using online resources and communities for learning and troubleshooting.

MODULE 10: PROJECT PLANNING, DEVELOPMENT, AND PRESENTATION

- Selecting and designing an electronics project.
- Prototyping, testing, and optimization.
- Project documentation and presentation skills.
- Final demonstration and peer feedback.

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