


LEARNING PROGRAMME

# Robotics and Coding in Education: Developing Digital and Computational Competences

5-DAY COURSE

25 learning hours | Course programme

# Robotics and Coding in Education: Developing Digital and Computational Competences – 5-Day Course

## Introduction and Description

This course provides an in-depth and research-informed examination of robotics and coding as pedagogical domains that meaningfully contribute to competence development across contemporary school curricula. As societies increasingly rely on automation, data-driven technologies and interconnected digital systems, educational robotics has emerged as a powerful medium through which learners encounter foundational concepts of computational thinking, systems reasoning and problem-solving. Building on theoretical perspectives from constructionism, embodied learning, and design-based education, this course positions robotics not merely as a technical skill but as a holistic learning environment that cultivates creativity, collaboration, autonomy, and epistemic agency.

Participants are introduced to a wide spectrum of educational technologies—from entry-level programmable floor robots to microcontrollers and open-source hardware platforms—allowing them to understand how different tools afford distinct learning trajectories and cater to diverse developmental stages. Through hands-on engagement with Blue-Bot®, Makey Makey, BBC micro:bit and Arduino, educators explore how learners construct knowledge through tangible manipulation, iterative experimentation and multimodal representation. Special attention is given to inclusive design principles and the potential of robotics to remove learning barriers for students with disabilities by offering alternative interaction modes, sensory-rich experiences and personalised pathways.

The course critically situates robotics and coding within broader European educational frameworks, including the Key Competences for Lifelong Learning and the Digital Competence Framework for Educators (DigCompEdu). Participants examine how robotics can enhance disciplinary learning across STEM subjects as well as in arts, humanities and interdisciplinary projects, thereby supporting curricular innovation and whole-school digital transformation. They also investigate ethical, safety and data-related considerations emerging from the integration of robotics and AI-based tools in school settings.

Throughout the course, educators collaborate to design, prototype and test innovative learning scenarios that reflect competence-based pedagogy, inquiry-driven approaches and principles of Universal Design for Learning. Emphasis is placed on the development of student-created artefacts—digital, physical, or hybrid—that serve as evidence of understanding and support reflective learning. The course further explores

opportunities for international collaboration through platforms such as eTwinning and the European School Education Platform, highlighting the potential of robotics to enrich transnational project-based learning.

By the end of the programme, participants will have gained a nuanced theoretical understanding and a robust practical repertoire for integrating robotics and coding into their teaching practice. They will be equipped to design inclusive, developmentally appropriate, and pedagogically sound activities that foster key competences and prepare learners to participate confidently and ethically in a rapidly evolving technological landscape.

## Methodology and Assessment

The course employs an experiential, workshop-based methodology centred on hands-on exploration, iterative design and collaborative problem-solving. Participants engage directly with multiple robotics platforms and coding environments, moving from guided practice to the co-creation of competence-based learning activities. Inclusive pedagogical principles and UDL guidelines shape all tasks, ensuring accessibility and applicability across diverse classrooms. Learning is supported through modelling, peer exchange, micro-projects and reflective dialogue. Assessment is formative and continuous, based on participants' engagement in practical workshops, their development of classroom-ready resources, and a final presentation of outcomes demonstrating understanding of robotics integration, competence development and pedagogical transferability.

## Learning Objectives

By the end of the course, participants will be able to:

### Understanding Robotics, Coding & Competence Development

• Analyse the pedagogical value of robotics and coding for fostering problem-solving, creativity, collaboration, and computational thinking.
• Explain foundational concepts of coding (sequencing, loops, conditionals, debugging) and relate them to learning progression models across school levels.
• Critically evaluate robotics as a competence-based approach aligned with EU frameworks (Key Competences, DigCompEdu).

### Designing Effective and Inclusive Learning Environments

• Apply principles of inclusive education and Universal Design for Learning in the design of robotics and coding activities.

• Identify adaptations and alternative input methods to support participation of students with disabilities.
• Integrate robotics across subjects through interdisciplinary STEAM-based approaches.

### Working with Educational Robotics & Physical Computing

• Operate and programme Blue-Bot®, Makey Makey, micro:bit and Arduino, selecting tools appropriate for different age groups and learning goals.
• Develop and test robotics tasks that scaffold learners' computational thinking through hands-on exploration and iterative design.
• Create digital and physical artefacts using coding tools to represent and communicate student learning.

### Implementing Robotics in Real School Contexts

• Design competence-oriented lesson plans involving robotics and coding, including assessment strategies and differentiation measures.
• Use digital platforms and collaborative tools (eTwinning, ESEP) to plan international projects involving robotics.
• Reflect critically on ethical, safety and data considerations in the use of robotics and AI-based coding tools in schools.

## Preparation

After registration participants will receive pre-course questionnaire which will be used by the trainer to learn about participants' teaching backgrounds and to assess their exact needs. Before the beginning of the course a basic reading list will be suggested to participants to prepare for the training. Participants will also be asked to prepare a presentation about themselves, their professional context and their culture. The presentation will be presented on the first day of the course to facilitate networking opportunities. Participants will receive information about the country they are going to visit in order to prepare them for their cultural experience.

## Follow up

After the course participants will be asked to share what they have learned with the rest of the staff in their schools. Further books and articles to deepen the topic and contacts with some other practitioners all over Europe and in the world will be suggested by the trainer. The methods shared and explored and the bibliography given will allow the participants to complete and improve their educational path.

## Certificate

Certificate complies with the guidelines of the Erasmus+ programme and includes the topic, number of didactic hours, dates and location of the course. We can list the record of learning outcomes on the Europass Mobility Document on request of participants. In case a participant requires a specific format of certificate we can accommodate that if requested at least one week before the start of the course. It is necessary to attend at least 80% of the hours in order to receive the certificate.

## Accommodation

We do not directly offer accommodation and subsistence and participants are responsible for organizing it by themselves.

## Paperwork

We also provide all the support with paperwork you might need for your Erasmus+ project documentation such as mobility agreement and registration letter.

## Fee: 400 €

## Cancelation policy

We have a flexible cancellation policy in force at the moment and you can cancel your registration up to 30 days before the course and receive a full refund. In case you don't cancel the registration more than 30 days before you will not receive any refunds, but you will be able to choose to attend any other confirmed course session later (within 6 months) without any additional costs. In case you are not able to travel, your school can send someone else to take instead of you and you can change the details of the participant any time before the start of the course at no additional cost.

TENTATIVE PROGRAMME (25 didactic hours - 5*45min per day) Monday to Friday

| Day 1 | Foundations of Robotics, Coding & Competence-Based Pedagogy |
|---|---|
| 09.00 - 09.45 | Introductions & Icebreakers |
| 09.45 - 10.30 | Course Overview & Learning Agreement |
| 10.30 - 11.15 | Overview of robotics in education and current trends |
| 11.15 - 11.30 | Break |
| 11.30 - 12.15 | Coding principles & computational thinking frameworks |
| 12.15 - 13.00 | Digital safety, ethics and responsible innovation |
| Day 2 | Hands-On Robotics |
| 09.00 - 09.45 | Programming with Blue-Bot® |
| 09.45 - 10.30 | Makey Makey as a tool for creativity & STEAM |
| 10.30 - 11.15 | Inclusive robotics: Universal Design for Learning (UDL) |
| 11.15 - 11.30 | Break |
| 11.30 - 12.15 | Coding for beginners using block-based environments |
| 12.15 - 13.00 | Classroom applications |
| Day 3 | Intermediate Physical Computing |
| 09.00 - 09.45 | micro:bit introduction and sensor-rich activities |
| 09.45 - 10.30 | Project-based tasks with micro:bit |
| 10.30 - 11.15 | Introduction to Arduino |
| 11.15 - 11.30 | Break |
| 11.30 - 12.15 | Arduino classroom applications |
| 12.15 - 13.00 | Robotics and embedded systems |
| Day 4 | Coding, Digital Creativity & Apps that Enable Learning Artefact Creation |
| 09.00 - 09.45 | Coding in the classroom: models and pedagogy |
| 09.45 - 10.30 | Apps and platforms for teaching coding skills |
| 10.30 - 11.15 | Tools that enable students to create learning artefacts |
| 11.15 - 11.30 | Break |
| 11.30 - 12.15 | Developing innovative resources for robotics and coding |
| 12.15 - 13.00 | Robotics in eTwinning & international collaboration |

| Day 5 | Advanced Integration, Creation, Reflection & Evaluation |
|---|---|
| 09.00 - 09.45 | Creating full lesson plans with robotics/coding |
| 09.45 - 10.30 | Preparing the final presentations and individual support |
| 10.30 - 11.15 | Final presentations and feedback |
| 11.15 - 11.30 | Break |
| 11.30 - 12.15 | Evaluation & Reflection |
| 12.15 - 13.00 | Validation of learning outcomes and certification |

*This is only a tentative timetable. The exact hours or the course might differ and will be announced for each session 2 weeks before the start. However, there will always be a total of 5 didactic hours per day and all will be in line with the Erasmus+ quality standards. The trainer might slightly modify the content in response to the needs of the group.
**Cultural and social programmes will be organized in addition to the academic programme. The exact cultural and social programme depends on the location, season, weather, etc.