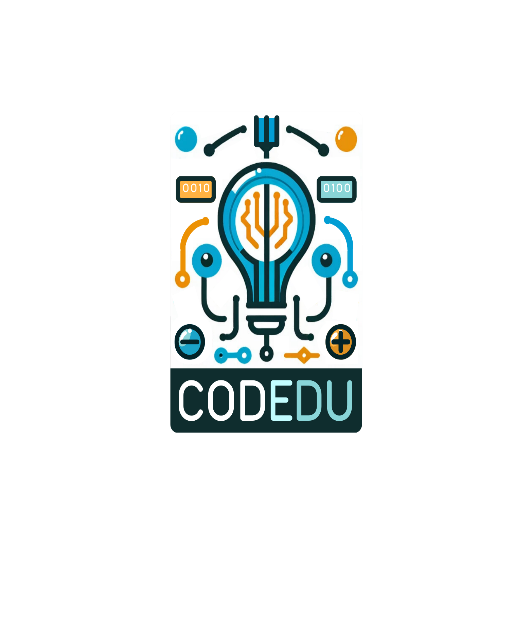
[[1]](#footnote-1)



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| **CODEDU’s Students’ Training Course** | | | | |
| **Section 4: Exploring Arduino Projects** | | | | |
| **Subject:** Arduino | **Duration (in hours):** around 8 hours | |  | |
| **Target audience:** Upper-primary and Secondary School Students | | | | |
| **Training methodology:**   * Project-Based Learning (PBL) * Hands-on experimentation with Arduino kits * Online simulations using Tinkercad * Group collaboration and teamwork * Step-by-step guidance on building and coding Arduino circuits | | | | |
| **Level (and cycle, if applicable) of the learning experience:** Upper-primary and secondary education | | | | |
| **Assessment method:** Practical projects and prototype demonstrations | | **Form of participation in the learning activity:** In-person and/or online | | |
| **Expected Learning Outcomes:**   * Understand the fundamentals of Arduino and its role in interactive projects. * Learn to build and program basic circuits using LEDs, buttons, sensors, and motors. | | * + Use simulation tools like Tinkercad to design and test circuits before building them.   + Collaborate with peers to develop creative projects that apply Arduino concepts.   + Gain confidence in working with electronics and coding for future STEM projects. | | |
| **Prerequisites needed to enrol in the learning activities (if needed):** | | | | |
| **Supervision and identity verification during an assessment:** | | | | |
| • Unsupervised with no identity verification. | | | |  |
| • Supervised with no identity verification. | | | | **X** |
| • Supervised online or onsite with identity verification. | | | |  |

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| **Module 4.1** |
| **Planning Your Project** |
| Structure  Organize Everything  When you start a project or a project is given to you, the most important thing to think about is organizing whether its organizing materials or time, organizing and building a coherent structure is the base of any project you must complete.  When organizing you need to think of the availability of schedule, materials and your own personal difficulties to work around these with ease when working on the other aspects of the project, for example, when organizing your time you need to think about the time of others in your group projects so that you can have a viable schedule that doesn’t interfere with anyone's time so that everything can be done during the imposed deadlines without the need of cramping the project on the last week.  After organizing your time and materials, you should organize and structure the steps of the project and in which order you need to work in so that when working with steps that depend on others you don’t have to go back and forward in between tasks and can focus on each task at a time saving you hours of difficulties.  In this step you also need to check schedules of available professors or tutors so that in case you are stuck in a specific step you have time to show your educators your difficulties during office hours which means that it is preferable if your work schedule is busier in the beginning of the project rather than later.  Importance of Goals  When talking about goals what comes to mind is always the end of the project and its result, but about your own personal goals? When we receive a project most of us think to robotically do the project without putting much thought into it because as long as the goal of the project is completed the work is done when that’s not exactly the case.  Inputting a personal learning goal is beneficial to the project because you actually learn the subject that the project was meaning to teach you all along and it helps you set a clear vision from beginning to end creating a more coherent development, it also helps with the analysis and presentation of said project due to the more personal insight that you can give others.  Building a Timeline  Timeline  During the development of the timeline, much like organizing, one must analyze everything that has to do with the project from the people in it, to the materials used to the methods of development.  To start the development of a timeline you must analyze what you are working with an calculate how much time each task consumes, and for that you need to sort those steps into 4 categories: Organization, Development, Analyzing and Arrangements. These will help you create a clearer structure to input the steps mentioned before in the steps for a project slide, this structure of course varies between people because we all have different insights on what goes where but we still have a generalized perception where these categories can help with structured thinking.    Brainstorming and Development  Brainstorming: The Base  Much like organizing is to the whole project, brainstorming is to the development on a smaller scale. When thinking about the brainstorming aspect and the ideas for development you have to keep in mind the structure that you’ve created before so that you can associate your structure with the aspects of the development like time, materials and colleagues involved. In this step you should also be imaginative without being unrealistic because that might cause problems with both time and resources in the future.  Development: The Result  The development and its result is dependent on how well your process of brainstorming was and how structured you were during the last steps. This part of the project usually has more complications than the rest which means you have to be extra careful with the division of tasks and how you work either solo or as a team because most tasks have dependencies on others so, as mentioned before, take your time in each step and leave space for mistakes to happen.  Analysis and Conclusion: The Connection  Even though these steps are separate it we need to understand that they are connected for one cannot exist without the other, some of us overlook analyzing our development and step straight to the end of the project which can impact your presentation and can make you overlook mistakes made during development. Analyzing is important for a more personal output during the conclusion and arrangements of the project and for the improvement of future projects.  Summary  A diagram of a project  Description automatically generated |

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| **Module 4.2** |
| **Basic Arduino Projects** |
| Introduction  Arduino is a powerful yet simple platform that allows anyone to create interactive projects. This presentation explores how to build simple Arduino projects using components like buttons, sensors, LEDs, and motors.  SBC, Arduino UNO Rev3, ATmega328P, 8bit, 2KB RAM, 32KB Flash, 14 I/O pinsLED Diode PNG Images & PSDs for Download | PixelSquid - S11745314DResistor 2K2 1/4W (10 Unidades) - Eletrogate - 12 anos!DC Motor, Miniature, Brushed, 3 V, 12400 rpm, 10 g-cm, 1.23 W, 20 mmLDR 5mm - Sensor de luminosidade  By learning the role of these components and understanding basic circuits, you’ll gain the foundational knowledge needed to bring creative ideas to life and tackle more advanced projects in the future.  Project explanation  The simple project that we are going to do is using an Arduino UNO, with a button and an LED, and when the said button is pressed, the LED is going to light up!  SBC, Arduino UNO Rev3, ATmega328P, 8bit, 2KB RAM, 32KB Flash, 14 I/O pinsLED Diode PNG Images & PSDs for Download | PixelSquid - S11745314D |

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| **Activity** | |
| **Activity** |  |
| Opening the website  Open the website <https://tinkercad.com/circuits> and press the “Sign Up” button and then press “Create a personal account”      Create a new circuit design  Now go to the “Designs” tab, the “Circuits” Section and then click the “Create” Button and “Circuits”    Design the Circuit  Now Drag-n-drop the components like this:    Now copy this design:    Code the Circuit  Now press the “Code” button and copy this code    How does it work?  Now press the “Start Simulation” button and now it work, if you press the circuit button the LED is going to light up!      How does it work? (Code)  This code works by continuously checking whether a button is pressed. When the button is pressed, the system turns on an LED; if the button is not pressed, the LED remains off. This process repeats in a loop, ensuring the LED responds immediately to the button's state. |
| **Sources:** |
| **Extra contents:** |

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| **Activity (Assessment of Module 4.2)** |
| **Type:** Practical projects and prototype demonstrations |
| Based on the knowledge acquired in the training, participants should develop a small functional project using Arduino and sensors to their liking, which can first be simulated in Tinkercad before physical implementation.  Assessment criteria:  Originality of the idea (10%)  Degree of difficulty (20%)  Correct functioning of the circuit (30%)  Well-structured and functional code (30%)  Presentation and explanation of the project (10%) |

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| **Module 4.3** |
| **Creative Arduino Projects** |
| Introduction  In the last PowerPoint, we explored the basics of Arduino—understanding its core functionality and getting familiar with simple coding. Today, we’re building on that foundation by diving into the essentials of some of the most commonly used electronic components.By the end of this presentation, you'll not only know how these components work and how to use them, but you'll also get hands-on experience by designing and building your very own Arduino project.  SBC, Arduino UNO Rev3, ATmega328P, 8bit, 2KB RAM, 32KB Flash, 14 I/O pinsLED Diode PNG Images & PSDs for Download | PixelSquid - S11745314DResistor 2K2 1/4W (10 Unidades) - Eletrogate - 12 anos!DC Motor, Miniature, Brushed, 3 V, 12400 rpm, 10 g-cm, 1.23 W, 20 mmLDR 5mm - Sensor de luminosidade  LED (Light Emitting Diode)  An LED (Light Emitting Diode) is a small electronic component that emits light when an electric current flows through it. It’s a highly energy-efficient light source, commonly used in electronic circuits for indicators, displays, and even illumination. LEDs come in various colors and sizes, with some capable of emitting multiple colors.  To connect the LED to the Arduino simply connect the  Anode to a digital pin and the cathode into ground  5mm LED Pinout, Features, Forward Voltages & DatasheetLED Diode PNG Images & PSDs for Download | PixelSquid - S11745314D    LDR (Light Dependent Resistor)  An LDR (Light Dependent Resistor), also known as a photoresistor, is a sensor that changes its resistance based on the amount of light falling on it. When exposed to bright light, its resistance decreases, allowing more current to pass through. In darkness, its resistance increases, limiting the flow of current. LDRs are commonly used in light-sensing applications like automatic streetlights, brightness control systems, and light-following robots.  To connect the LDR to the Arduino just connect one of the legs to  5v and the other to GND with a 1kΩ resistor and to a analog pin.  LDR 5mm - Sensor de luminosidade    Button  A button (or pushbutton) is a simple switch that can open or close a circuit when pressed. Buttons are commonly used as user inputs in electronics, such as controlling devices, starting processes, or navigating menus.  To connect the button just copy the connections as the example  With a 1kΩ resistor.  Momentary Pushbutton Switch - 12mm Square - COM-09190 - SparkFun Electronics    Potentiometer  A potentiometer is a variable resistor that allows you to control resistance by turning a knob or slider. It's commonly used to adjust parameters like volume, brightness, or motor speed in electronic projects.  To connect the pins like this:  1st terminal to GND.  2nd terminal to an analog input pin on the Arduino.  3rd Terminal to the 5V pin on the Arduino.  Potentiometer - Wikipedia    Buzzer  A buzzer is a simple sound-producing device used in various applications like alarms, notifications, and sound effects. It can generate a tone when powered.  To connect the pins like this:   * + : Digital pin. * GND: Ground connection.   Utilizando o Buzzer Ativo no Arduino - Blog da Robótica    HC-SR04 (Ultrasonic Sensor)  The HC-SR04 is an ultrasonic distance sensor that measures the distance to an object using sound waves. It's widely used in robotics, obstacle detection, and distance measurement applications.  To connect the pins like this:   * Connect the **VCC** pin to the 5V pin on the Arduino. * Connect the **GND** pin to the GND on the Arduino. * Connect the **TRIG** pin to a digital pin. * Connect the **ECHO** pin to another digital pin.       PIR Sensor (Passive Infrared)  A PIR (Passive Infrared) sensor detects motion by sensing changes in infrared radiation (heat) in its surroundings. It’s widely used in motion detection applications, such as security systems, automatic lighting, and energy-saving systems.  To connect the pins like this:   * VCC: Power supply (usually 5V or 3.3V). * GND: Ground connection. * OUT: Signal pin       Micro Servo  A micro servo is a small and lightweight motor capable of precise angular motion. It’s commonly used in robotics, remote-controlled vehicles, and hobby projects due to its compact size and ease of control.  To connect the pins like this:  Red (VCC): Power supply (connect to 5V).  Brown/Black (GND): Ground connection.  Orange/Yellow (Signal): Control signal from the Arduino. |

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| **Activity** | |
| **Activity** | **Create your own circuit** |
| **Learning outcomes:**  *After this module you will be able to:*  Now that you’ve learned the basics of various components and how they work with Arduino, it’s time to unleash your creativity and design your own circuits! This is where you can apply everything you’ve learned so far and experiment with combining different components to create unique and functional circuits. Whether you're building a simple project or aiming for something more advanced, designing your own circuit allows you to explore endless possibilities and bring your ideas to life.  Here are a few circuit ideas to inspire you:   * LED Blink with Button * Light-sensitive LED with LDR * Ultrasonic Distance Measurement * Servo motor Control with Potentiometer * PIR Motion Detection alarm * Traffic Light Simulation   These are just a few examples to get you started, but the real fun begins when you start combining components in creative ways. You can build interactive systems, automation projects, or even game-like applications with your Arduino!  Arduino Logo PNG Transparent (1) – Brands Logos |
| **Sources:** |
| **Extra contents:** |

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| **Activity (Assessment of Module 4.3)** |
| **Type:** Practical projects and prototype demonstrations |
| Based on the knowledge acquired in the training, participants should develop a small functional project using Arduino and sensors to their liking, which can first be simulated in Tinkercad before physical implementation.  Assessment criteria:  Originality of the idea (10%)  Degree of difficulty (20%)  Correct functioning of the circuit (30%)  Well-structured and functional code (30%)  Presentation and explanation of the project (10%) |

1. [↑](#footnote-ref-1)