

Arduino basic (using Tinkercad)

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"Introduction to Arduino with Tinkercad Circuits" is an engaging and hands-on course designed to teach the fundamentals of Arduino programming and electronic circuit design using the Tinkercad Circuits website. Participants will learn how to create, simulate, and test Arduino-based projects in a user-friendly virtual environment. The course covers essential concepts such as basic input/output operations, sensors, actuators, and communication protocols. By the end of the course, students will be equipped with the skills to design and prototype their own Arduino-powered devices and applications.

LEARNING OBJECTIVES

- Understand the basics of Arduino hardware and software components.
- Navigate and utilize the Tinkercad Circuits website effectively for designing and simulating Arduino projects.
- Implement basic input/output operations using digital and analog pins.
- Integrate various sensors and actuators into Arduino projects to interact with the physical environment.
- Apply conditional statements, loops, and functions to create efficient Arduino code.
- Use serial communication for debugging and data transfer between Arduino and other devices.
- Implement common communication protocols such as I2C and SPI to interface with external components.
- Design and build custom circuits using breadboards, resistors, capacitors, and other electronic components.
- Troubleshoot and debug Arduino code and circuits to identify and resolve issues.
- Develop the skills to independently prototype and create Arduino-based projects for real-world applications.

C'S OF EDUCATION

COLLABORATION

COMMUNICATION

CRITICAL THINKING

CREATIVITY

AGE GROUP

From 13 to 19

SCENARIO LANGUAGE

English

TOTAL DURATION

13 hours 30 minutes

SUBJECTS

DESIGN - TECHNOLOGY

INFORMATICS / ICT

S1: INTRODUCTION TO ARDUINO & CIRCUITS

45
MINUTES

A1.1: Course overview and introduction to Arduino

INTERACT & INSTRUCT

C'S OF EDUCATION

COMMUNICATION

CREATIVITY

TOOLS

Props

DESCRIPTION

Students do research and gather information about important figures related to a given topic and then dress up (or use a prop) to create a 'talking wax museum'. A student can take the role of the museum guide or the audience can interview the figures directly.

45
MINUTES

A1.2: Creating a Tinkercad account and exploring the interface

CREATE

C'S OF EDUCATION

COLLABORATION

CRITICAL THINKING

TOOLS

Poll or brainstorm tool

DESCRIPTION

Students brainstorm on open ended questions about a certain topic. They create in small groups a driving question for their project work.

45
MINUTES

A1.3: Assembling a basic Arduino circuit in Tinkercad

CREATE

C'S OF EDUCATION

CRITICAL THINKING

TOOLS

Interactive video tool

DESCRIPTION

The teacher shares a video with the students to which feedback questions, instructions or quizzes have been added. By analyzing the individual results on the platform of the tool, the teacher gets feedback on the understanding of the students.

S2: BASIC INPUT/OUTPUT OPERATIONS

45
MINUTES

A2.1: Digital input and output with LED and pushbutton

INVESTIGATE & RESEARCH

C'S OF EDUCATION

COLLABORATION

COMMUNICATION

CRITICAL THINKING

CREATIVITY

TOOLS

The visual presentation can be created on a paper poster with crayons.

DESCRIPTION

Firstly students work in small groups on a certain topic assigned by a teacher. The different groups create a visual presentation (e.g. a poster) of their topic. Then, they are divided into new groups and rotate between the stations teaching each other about the content they were working on.

45
MINUTES

A2.2: Analog input using a potentiometer

INVESTIGATE & RESEARCH

C'S OF EDUCATION

COMMUNICATION

CRITICAL THINKING

TOOLS

Infographic tool

DESCRIPTION

Students analyse data and create an infographic poster which visualizes and summarizes the core components as well as the logical relations between the components.

45
MINUTES

A2.3: PWM output with an RGB LED

INVESTIGATE & RESEARCH

C'S OF EDUCATION

COMMUNICATION

CRITICAL THINKING

TOOLS

Online quiz platform and a quiz prepared by the teacher in advance.

DESCRIPTION

A short, ungraded online quiz to check for understanding (True/False, multiple choice, matching, etc.). Students can discuss their answers in pairs before answering. Both students and the teacher receive immediate feedback. Depending on the type of quiz (with questions displayed on the main screen or on students' devices only), the teacher can provide general feedback for the whole class group or students can work independently on the feedback provided on their screens.

S3: WORKING WITH SENSORS AND ACTUATORS

45
MINUTES

A3.1: Temperature sensing with a thermistor

EXCHANGE & DISCUSS

C'S OF EDUCATION

COMMUNICATION

CREATIVITY

TOOLS

Rubric tool

DESCRIPTION

"A fair activity is a chance for groups to present their project simultaneously. In the first part of the lesson, half of the class (formed by the sum of the halves of all the groups) present their product at their stands. The other half of the class plays the visitors' role and they listen and at the same time assess the speakers. The visitors can walk around as if they were on a real fair. After half-time the students swap roles.

"

45
MINUTES

A3.2: Distance measurement using an ultrasonic sensor

EXCHANGE & DISCUSS

C'S OF EDUCATION

CRITICAL THINKING

TOOLS

Form or poll tool

DESCRIPTION

Students provide feedback on their level of interest in the concept or topic suggested by their peers or by the teacher. They can show that they are very much interested, quite interested, or not interested at all. Alternatively, they can grade their level of interest on a scale, e.g. from 1 to 10.

45
MINUTES

A3.3: Controlling a servo motor

EXCHANGE & DISCUSS

C'S OF EDUCATION

COMMUNICATION

CRITICAL THINKING

TOOLS

Polling tool

DESCRIPTION

Before, after or during a speech, the teacher asks a question to the class. Students answer (with a short paragraph) individually or in groups using a voting tool. Answers are displayed on the board and can be discussed with the class. For instance "what can we learn from this activity?" would be a good question to raise metacognition skills. PROS : every student has time to think and propose an answer.

45
MINUTES

A4.1: Conditional statements and control structures

PRESENT & SHARE

C'S OF EDUCATION

COLLABORATION

COMMUNICATION

CRITICAL THINKING

CREATIVITY

TOOLS

Rubric tool

DESCRIPTION

The learners are positioned in an inner and an outer circle. The students in the inner circle discuss a topic and the members of the outer circle observe someone from the inner circle, by making notes and/or using a rubric.

45
MINUTES

A4.2: Loops and iteration

CREATE

C'S OF EDUCATION

COLLABORATION

COMMUNICATION

CRITICAL THINKING

CREATIVITY

TOOLS

A smartphone or a computer with a microphone. Any podcasting or audio-editing app. Some isolated space to carry out the recording.

DESCRIPTION

Teams of students do research on a topic they have chosen or have been assigned to and they record a podcast to demonstrate what they have learned. Podcasts can be placed online, where they will be available to anyone or to a limited audience, or they can be distributed as audio files. A podcast can be just recording of a monologue or an interview, e.g. an interview with an expert.

45
MINUTES

A4.3: Functions and code organization

CREATE

C'S OF EDUCATION

COMMUNICATION

CRITICAL THINKING

TOOLS

Three columns (Know, What, Learn) on paper or on digital canvas or shared document.

DESCRIPTION

The students reflect on a topic provided by the teacher:

1. What do you KNOW about the topic?
2. WHAT have you learned?
3. What would you still LIKE to learn more?

The activity can be done alone or in small groups.

S5: COMMUNICATION AND DATA TRANSFER

45
MINUTES

A5.1: Introduction to serial communication

PRESENT & SHARE

C'S OF EDUCATION

COMMUNICATION

CREATIVITY

TOOLS

Presentation or Web-conferencing tool

DESCRIPTION

Students are required to present their group project findings in a mini-conference. Teachers assigns each student a role to play when presenting e.g. a politician, a researcher, an author.

45
MINUTES

A5.2: Sending data from Arduino to a computer

CREATE

C'S OF EDUCATION

COMMUNICATION

CRITICAL THINKING

TOOLS

Both resource list and questions can be added to a shared online document.

DESCRIPTION

Students are presented with a specific problem or question and with a selection of resources (usually a list of links to online materials) that they can use to answer the question.

45
MINUTES

A5.3: Receiving data from a computer to control Arduino

CREATE

C'S OF EDUCATION

CRITICAL THINKING

TOOLS

If necessary the quotes can be presented with a slideshow.

DESCRIPTION

All the students are asked to stand up. If they agree with a quote (said by teacher, another student or written on the board) they're invited to sit down.

S9: FINAL PROJECT AND COURSE WRAP-UP



A9.1: Developing and presenting a unique Arduino-based project

PRESENT & SHARE

C'S OF EDUCATION

CRITICAL THINKING

TOOLS

Double sided green-red card, or 2 cards (green and red).

DESCRIPTION

The students can use a double-sided card to show whether they understand the different parts of the lesson (green) or when they need a clarification (red).



A9.2: Peer feedback and project refinement

ASSESSMENT & FEEDBACK

C'S OF EDUCATION

DESCRIPTION

aaa



A9.3: Course summary and next steps for further learning

INTERACT & INSTRUCT

C'S OF EDUCATION

COLLABORATION

COMMUNICATION

CRITICAL THINKING

TOOLS

Three columns (3, 2, 1) on paper or on digital canvas or shared document.

DESCRIPTION

Students must create three lists, (a) 3 ideas or concepts they learned, (b) 2 ideas or concepts that surprised them and (c) 1 thing they want to do based on what they learned or question they have about the content.



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