**………………………………. Outline**

Learn the Arduino web based IDE and basic Arduino programming by implementing the basic blink program and modifying it to blink external LEDs.

**Objectives**

* Use constants and variables,
* Explain the difference between syntax, logic, and run-time errors in computer programs;
* Demonstrate the ability to correct syntax, logic, and run-time errors in computer programs;
* Design a simple program from a program template or skeleton (e.g., teacher-supplied skeleton, Help facility code snippet);
* Use Help documentation as a guide to designing and writing programs.
* Use the features of a software development environment to debug programs and create functioning computer programs;
* Work independently, using the Help function, to resolve syntax issues while programming;
* Work independently, using reference materials (e.g., code snippets, sample programs, APIs, tutorials), to design and write functioning computer programs.
* Describe the functions and features of a software development environment and use it to write and run a computer program;

**Prerequisites**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Prerequisite Module(s)** | **Level** | **Student Initial** | **Teacher Initial** | **Date** |
| None |  |  |  |  |

**Materials**

* Arduino Web Development Environment (IDE)

**Level 0: Create an Arduino Account**

On-line Resource: <https://create.arduino.cc/>

NOTE: Always use Chrome for the Web IDE.

1. Go to the website and Select “Arduino Web Editor” and “Create a New Account”. Follow instructions.
2. Check your personal email to confirm your account. Then login and Select “Arduino Web Editor” and agree to terms & conditions (read this first).
3. Download and install the plug-in. (Note: The plug-in may fail to load correctly which is ok for now.)
4. Follow the editor tour and the tutorial at: <https://create.arduino.cc/projecthub/Arduino_Genuino/getting-started-with-the-arduino-web-editor-4b3e4a>

**Level 1: Understanding the Blink Example**

1. Select the menu item “Examples” 🡪 “Basic” 🡪 “Blink”.
2. Make sure the sketch code is loaded into the editor window.

NOTE: Skip steps 3 & 4 for now. Go to Level 2 and return when the plug-in is debugged.

1. Connect the Arduino board to your PC using the USB cable.
2. Upload and run the Blink sketch code on the Arduino board.

**Level 2: Using External Documentation**

On-Line Resource: <https://www.arduino.cc/en/Reference/HomePage>

1. Read the on-line documentation to become familiar with the Arduino IDE and command language.
2. Identify each program command and program statement in your blink program.
3. Use the on-line documentation to make notes on each command so you understand and can explain every part of your program.

* The setup() function is called when a sketch starts. Use it to initialize variables, pin modes, start using libraries, etc. The setup function will only run once, after each power up or reset of the Arduino board.
* The loop() function does precisely what its name suggests, and loops consecutively, allowing your program to change and respond. Use it to actively control the Arduino board.
* digitalWrite() = Write a HIGH or a LOW value to a digital pin

**Variables:**

* The meaning of HIGH (in reference to a pin) is somewhat different depending on whether a pin is set to an INPUT or OUTPUT.
* The meaning of LOW also has a different meaning depending on whether a pin is set to INPUT or OUTPUT
* The constant LED\_BUILTIN is the number of the pin to which the on-board LED is connected
* delay() pauses the program for the amount of time (in miliseconds) specified as parameter. (There are 1000 milliseconds in a second)

1. Explain the difference between a constant and a variable.

Variables can change their value at any time but constants can never change their value. A variable is something that may change in value. Constants are quantities of values that do not change during program execution.

1. Explain the following:
   1. Syntax error: an error in a program due to a code that does not function to the order expected by the programming language.
   2. Logic error: is a mistake in a program's source code that results in incorrect or unexpected behavior.
   3. Run-time error: runtime error is a program error that occurs while the program is running.

**Level 3: Extend the Blink Pattern**

1. Modify the blink program to produce two short blinks followed by one long blink.
2. Use a variable to control the blink time.
3. Upload and run the Extended Blink sketch code on the Arduino board and show it to your teacher.

void setup() { pinMode(LED\_BUILTIN, OUTPUT);}void loop() { digitalWrite(LED\_BUILTIN, HIGH); delay(1000); digitalWrite(LED\_BUILTIN, LOW); delay(1000); digitalWrite(LED\_BUILTIN, HIGH); delay(1000); digitalWrite(LED\_BUILTIN, LOW); delay(1000); digitalWrite(LED\_BUILTIN, HIGH); delay(3000); digitalWrite(LED\_BUILTIN, LOW); delay(1000); }

**Level 4: Add External LED**

On-Line Resource: S:4Students\OUT\Nestor\Arduino

* + Getting started guide.pdf
  + Public\_materials🡪Ebook🡪Arduino book.pdf
  + Lessons🡪Lesson1-LED blink

1. Add a second external LED (using components on the prototype board) and make it blink in sync with the on-board LED.
2. Modify your program so that the external LED blinks following a different pattern than your on-board LED.
3. Upload and run the External LED Blink sketch code on the Arduino board and show it to your teacher.

**Achievement Record**

|  |  |  |  |
| --- | --- | --- | --- |
| **Attainment Level** | **Student Initial** | **Teacher Initial** | **Date** |
| Level 0: Code & Run Basic Program |  |  |  |
| Level 1: Use External Documentation |  |  |  |
| Level 2: Extend Blink Pattern |  |  |  |
| Level 3: Add External LED |  |  |  |
| Level 4: Add Sequence of LEDs |  |  |  |