

A Beginner's Guide to Arduino Projects

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1 Introduction

Arduino is an open-source electronics platform based on easy-to-use hardware and software. It's designed to make digital electronics accessible to artists, hobbyists, and anyone interested in physical computing.

This guide walks you through beginner to intermediate projects and helps you build a solid understanding of how to use Arduino to make your ideas come to life.

2 Getting Started with Arduino

2.1 What You Need

- Arduino Uno board
- USB cable
- Breadboard
- LEDs and resistors
- Jumper wires
- Arduino IDE (download from <https://www.arduino.cc/en/software>)

2.2 Installing the Arduino IDE

Download and install the Arduino IDE, then plug your Arduino Uno into your computer. Choose your board and port from the **Tools** menu.

2.3 Your First Sketch

Blink an LED

This is the “Hello World” of Arduino.

```
1 void setup() {  
2     pinMode(13, OUTPUT);  
3 }  
4  
5 void loop() {  
6     digitalWrite(13, HIGH);  
7     delay(1000);  
8     digitalWrite(13, LOW);  
9     delay(1000);  
10 }
```

Listing 2.1: Blinking an LED

3 Project 1: LED Traffic Light

3.1 Objective

Simulate a basic traffic light using red, yellow, and green LEDs.

3.2 Components

- 1 x Red LED
- 1 x Yellow LED
- 1 x Green LED
- 3 x 220 Resistors
- Breadboard and wires

3.3 Wiring Diagram

3.4 Code

```
1  int red = 2;
2  int yellow = 3;
3  int green = 4;
4
5  void setup() {
6      pinMode(red, OUTPUT);
7      pinMode(yellow, OUTPUT);
8      pinMode(green, OUTPUT);
9  }
10
11 void loop() {
12     digitalWrite(green, HIGH);
13     delay(5000);
14     digitalWrite(green, LOW);
15     digitalWrite(yellow, HIGH);
16     delay(2000);
17     digitalWrite(yellow, LOW);
18     digitalWrite(red, HIGH);
19     delay(5000);
```

```
20   digitalWrite(red, LOW);  
21 }
```

Listing 3.1: Traffic Light Simulation

4 Project 2: Temperature Monitor with LCD

4.1 Objective

Display the temperature using a DHT11 sensor and an LCD.

4.2 Components

- DHT11 Sensor
- 16x2 LCD
- 10k potentiometer
- Breadboard and wires

4.3 Code

```
1 #include <DHT.h>
2 #include <LiquidCrystal.h>
3
4 #define DHTPIN 2
5 #define DHTTYPE DHT11
6 DHT dht(DHTPIN, DHTTYPE);
7
8 LiquidCrystal lcd(7, 8, 9, 10, 11, 12);
9
10 void setup() {
11     lcd.begin(16, 2);
12     dht.begin();
13 }
14
15 void loop() {
16     float t = dht.readTemperature();
17     lcd.clear();
18     lcd.print("Temp: ");
19     lcd.print(t);
20     lcd.print(" C");
21     delay(2000);
```

22 }

Listing 4.1: Temperature Display

5 Project 3: Light Follower Robot

5.1 Objective

Create a robot that moves toward light using photoresistors.

5.2 Components

- Arduino Uno
- 2 x LDRs (light sensors)
- Motor driver (L298N)
- 2 DC motors with wheels
- Power supply

5.3 Overview

Use the LDR values to decide which direction the robot should turn.

6 Debugging and Troubleshooting

6.1 Common Issues

- Board not detected: Check drivers and USB cable.
- Code won't upload: Make sure you selected the correct port.
- Nothing happens: Double-check circuit wiring and code logic.

7 Tips for Advancing Further

- Use libraries from the Arduino Library Manager.
- Try IoT with ESP8266 or ESP32 boards.
- Explore communication protocols like I2C, SPI, and UART.

8 Appendix: Useful Libraries

- `Adafruit_Sensor`
- `DHT`
- `LiquidCrystal`
- `Servo`

9 References and Resources

- <https://www.arduino.cc>
- <https://www.tinkercad.com>
- <https://randomnerdtutorials.com>