# Experiment – 1

**Aim: Introduction to Arduino and Tinkercad Platform.**

**Theory**

1.  Introduction to Arduino

        Arduino is an Italian open-source hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices. Its hardware products are licensed under a CC BY-SA license, while the software is licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially from the official website or through authorized distributors.

2.  Types of Board

| Type | Board Name | Year | Price (INR) (Approx.) |
|---|---|---|---|
| Basic | Arduino Uno | 2010 | ₹1,500 - ₹2,500 |
| Compact | Arduino Nano | 2008 | ₹500 - ₹1,500 |
| Mini | Arduino Micro | 2012 | ₹2,000 - ₹3,000 |
| Advanced | Arduino Mega 2560 | 2009 | ₹2,500 - ₹4,000 |
| Wi-Fi Enabled | Arduino Uno Wi-Fi Rev 2 | 2018 | ₹3,000 - ₹4,500 |
| IoT | Arduino MKR1000 | 2016 | ₹2,500 - ₹4,000 |
| Low Power | Arduino Pro Mini | 2005 | ₹300 - ₹800 |
| Wearable | Arduino Lilypad | 2007 | ₹1,500 - ₹2,500 |
| Industrial | Arduino Portenta H7 | 2020 | ₹9,000 - ₹12,000 |
| ESP-based | Arduino Nano 33 IoT | 2019 | ₹2,500 - ₹3,500 |

3.  Components Of Arduino Uno

| Component | Description |
|---|---|
| Microcontroller | ATmega328P - 8-bit AVR microcontroller |
| Operating Voltage | 5V |
| Input Voltage (Recommended) | 7-12V |
| Input Voltage (Limits) | 6-20V |
| Digital I/O Pins | 14 (6 PWM) |
| Analog Input Pins | 6 |
| PWM Pins | 6 (3, 5, 6, 9, 10, 11) |
| Flash Memory | 32 KB (0.5 KB used by bootloader) |
| SRAM | 2 KB |
| EEPROM | 1 KB |
| Clock Speed | 16 MHz |
| USB Interface | ATmega16U2 (for USB-to-Serial communication) |
| Communication | UART, I2C, SPI |
| DC Current per I/O Pin | 40 mA |
| DC Current for 3.3V Pin | 50 mA |
| Voltage Regulator | 5V and 3.3V (from onboard regulator) |

| Power Connector | Barrel Jack and Vin Pin |
|---|---|
| LED Indicators | Power (ON), TX/RX, and Pin 13 LED |
| Reset Button | Yes |
| Board Dimensions | 68.6 mm × 53.4 mm |
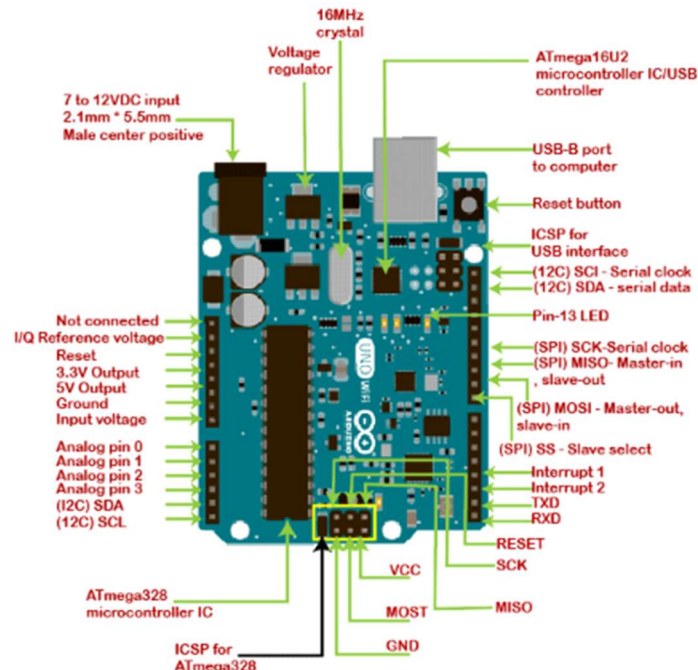


4. Pin diagram of Arduino Uno
5. Introduction to Tinkercad

      Tinkercad is a free-of-charge, online 3D modeling program that runs in a web browser. Since it became available in 2011 it has become a popular platform for creating models for 3D printing as well as an entry-level introduction to constructive solid geometry in schools.

      It is widely used by beginners, students, and hobbyists to create and simulate electronic circuits, including Arduino projects, without needing physical components. The platform provides an easy-to-use, drag-and-drop interface, making it accessible even for those with no prior experience in CAD (Computer-Aided Design). Tinkercad also supports block-based coding and text-based programming, allowing users to write and test Arduino code directly. Since it runs entirely in a web browser, no additional software installation is required, making it convenient for learning and prototyping.

6. Getting Started with Arduino on Tinkercad

Step 1: Sign Up & Log In
- Visit Tinkercad and create a free account or log in if you already have one.

Step 2: Access Circuits
- On the Tinkercad dashboard, click on "Circuits" from the left sidebar.
- Click "Create New Circuit" to start a new project.

Step 3: Add Arduino Board

- In the components panel, search for "Arduino Uno" and drag it onto the workspace.

Step 4: Add Components

- Search for additional components like LEDs, resistors, buttons, sensors, or motors, and place them in the circuit.

Step 5: Connect Components

- Use wires to connect the components properly.
- Ensure the correct power (5V, GND) and signal connections are made.

Step 6: Write & Upload Code

- Click on the "Code" button at the top.
- Choose "Blocks + Text" mode for visual programming or "Text" for writing Arduino code in C++.
- Write or modify the existing Arduino sketch (code).

Step 7: Simulate the Circuit

- Click the "Start Simulation" button to test your circuit.
- Observe how components behave and check for errors.

Step 8: Debug & Improve

- If the circuit isn't working as expected, check connections, code, and component values.
- Modify the setup or code as needed.

Step 9: Save & Share

- Click on "Save" to store your project.
- You can also share the project with others using a link.

Conclusion

Both Tinkercad and Arduino are powerful tools that help beginners and professionals explore electronics and programming. Arduino provides a hands-on experience with microcontrollers, making it ideal for building real-world projects like robotics, home automation, and IoT applications. On the other hand, Tinkercad offers a virtual simulation platform, allowing users to design, test, and debug circuits without needing physical hardware.