

Lab-1

Objective:

- 1) To get familiarized with Arduino and Tinkercad simulation software.
- 2) To turn ON and turn OFF a LED using Arduino.

Introduction to Tinkercad:

Tinkercad is a free, online 3D modelling program that runs on any web browser and allows easy simulation of circuits (in our case) online. It will help us virtually create and program Arduino projects without the need of physical hardware. It contains many digital and analog circuit components.

Create a Tinkercad account:

1. Open <https://www.tinkercad.com/> and on right top-screen click Join.
2. Create a personal account with your email id.
3. A successful login will transition to dashboard with the users' name (as shown in Fig. 1) with options of designing 3D models, circuits, codeblocks etc. popped up on left of the screen.
4. Select circuits to seamlessly enjoy Tinkercad circuits.

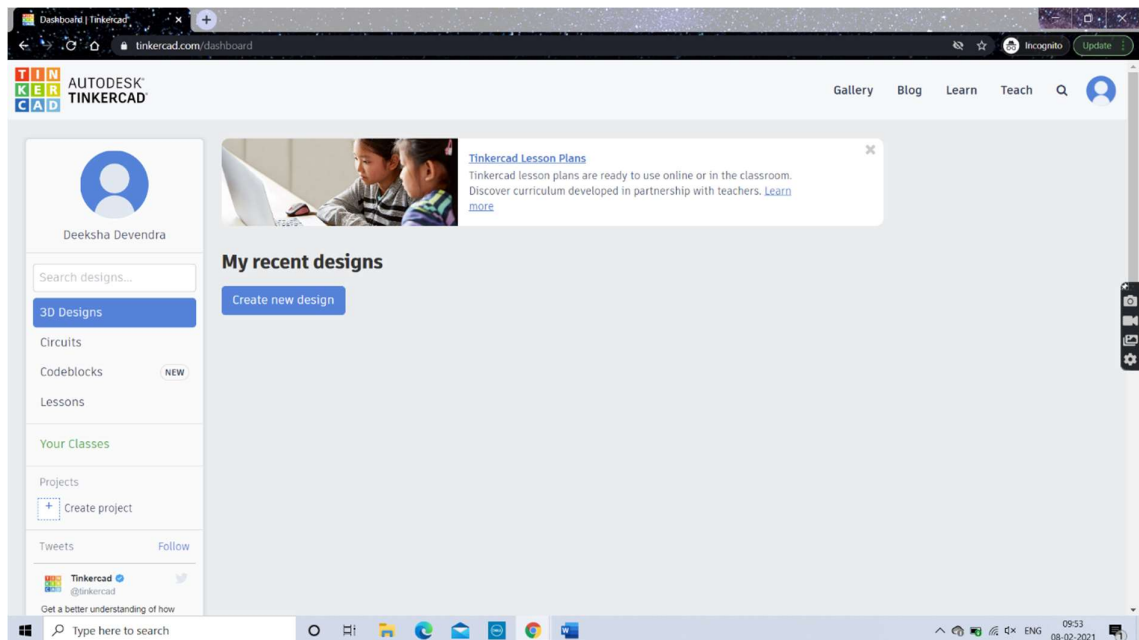


Fig: 1 Dashboard of Tinkercad

Building circuits with Tinkercad:

1. Go to 'Create new design'.
2. Give a filename on left top of the screen to save the design.



Fig 2: Work arena of Tinkercad Circuits

3. A circuit usually contains input, output, and processing components. So accordingly, select the components and drag it to the working space.
Drag the breadboard to the working space and drag from one point to another for wire connect. You can provide wires with different colors and labels.

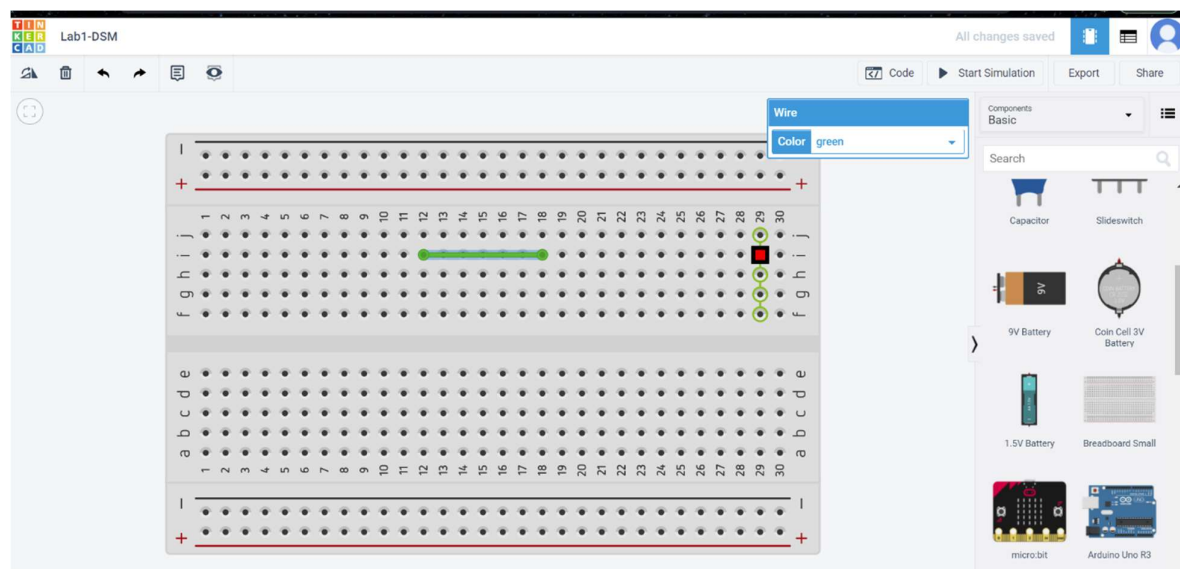


Fig. 3: Breadboard on Tinkercad

4. After the circuit is built dump the code in the code scroll down.
5. Press 'start simulation' tab to see the results.

Basic introduction to electronic components:

Arduino: Arduino acts as a single board microcontroller for building digital devices. It has an open source hardware and software. It helps perform specific of tasks of the embedded system as instructed by the software. Eg. Blinking LED etc. In our project we will be using Arduino Uno.

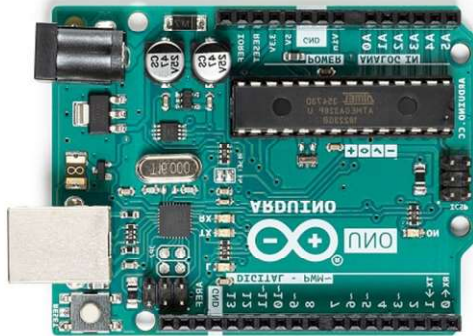


Fig. 4: Arduino Uno

Breadboard: The circuit to be studied will have to be assembled on the breadboard. Fig.5 shows the schematic of the breadboard. It has 128 vertical strips, 64 on each side of the horizontal divider in the middle, each strip consisting of 5 spring-loaded tie-points internally connected to another. Each connection among the circuit components is made with the help of tie-points connected together on the same strip. The breadboard also has 8 horizontal strips, four on the top side and 4 on the bottom side, each having 25 tiepoints. These strips are generally used for making power supply connections.

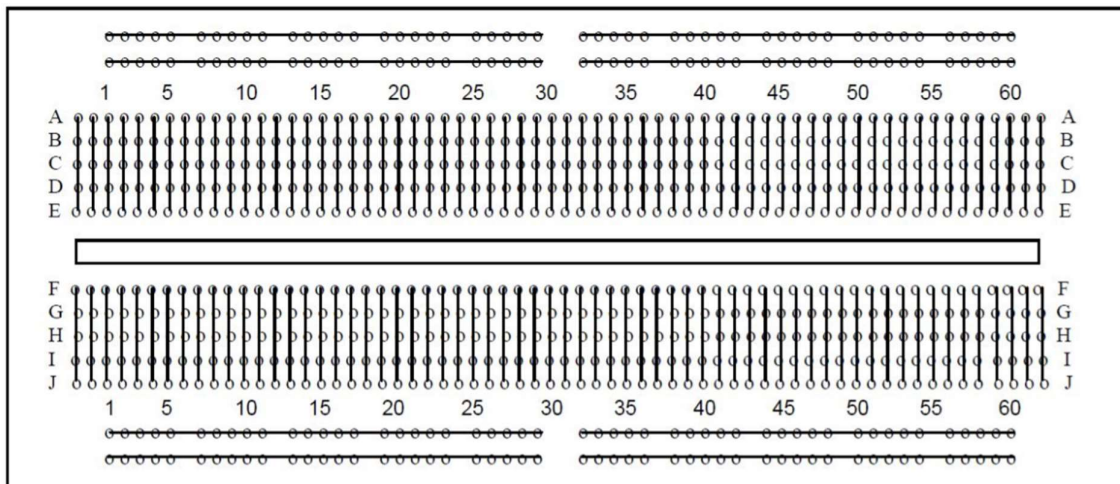


Fig. 5: Schematic of BreadBoard

Working with Arduino on Tinkercad:

Blinking LED on Arduino:

The code that has to be dumped into Arduino:

// the setup function runs once when you press reset or power the board

```
void setup() {
```

```
  // initialize digital pin LED_BUILTIN as an output.
```

```
  pinMode(LED_BUILTIN, OUTPUT);
```

```
}
```

// the loop function runs over and over again forever

```
void loop() {
```

```
  digitalWrite(LED_BUILTIN, HIGH); // turn the LED on (HIGH is the voltage level)
```

```
  delay(1000);           // wait for a second
```

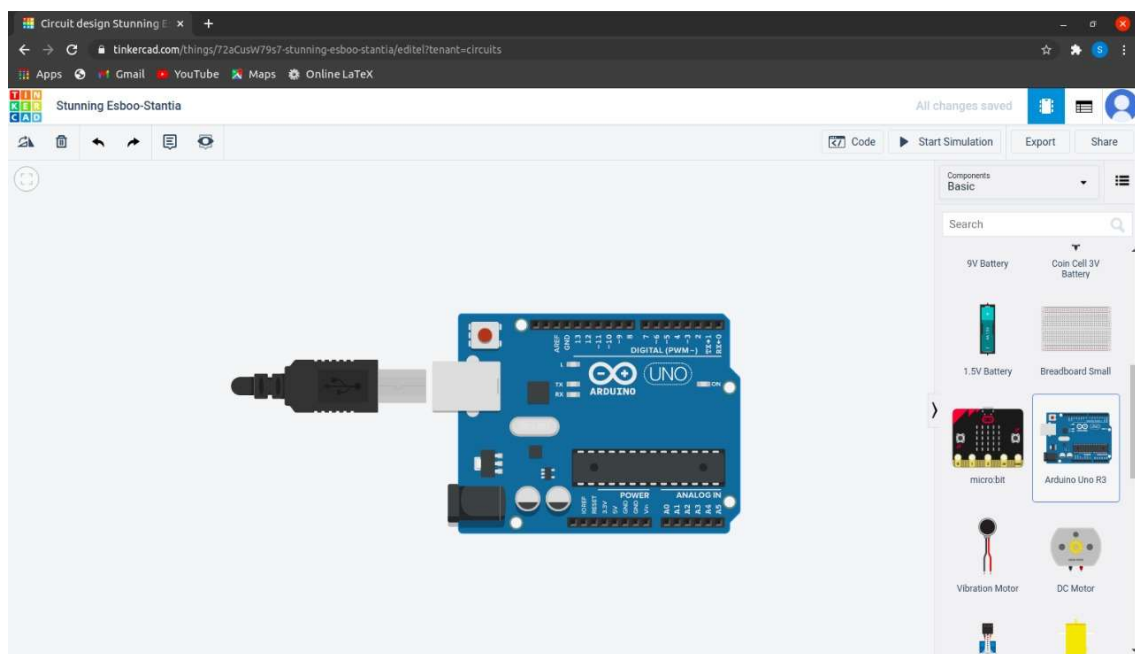
```
  digitalWrite(LED_BUILTIN, LOW); // turn the LED off by making the voltage LOW
```

```
  delay(1000);           // wait for a second
```

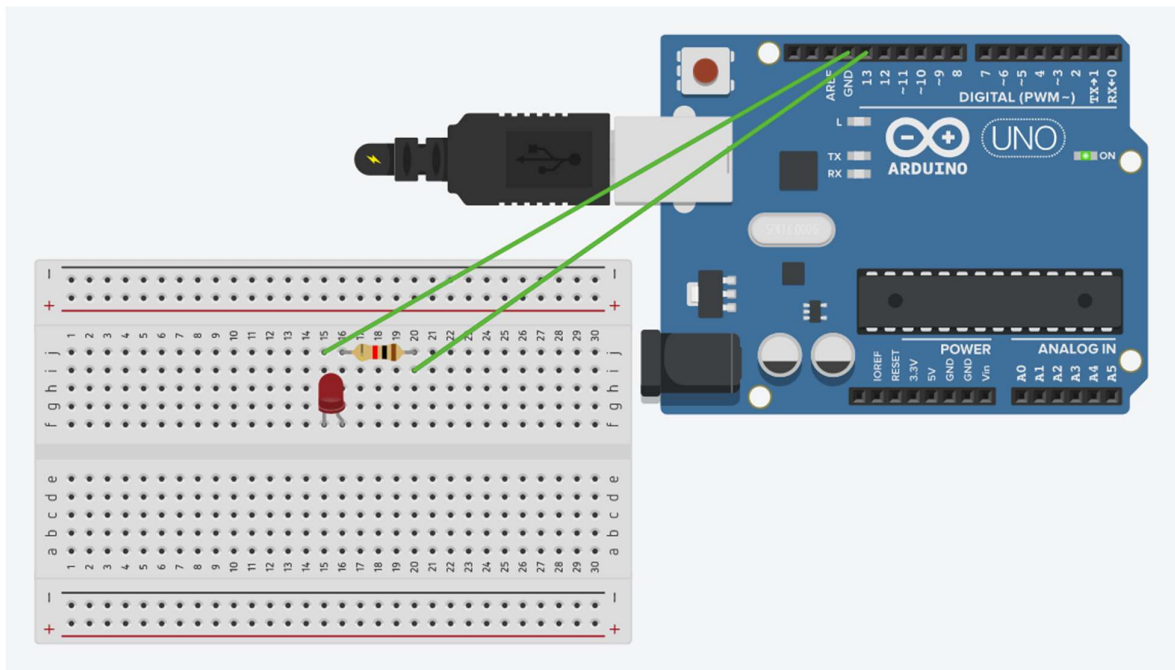
```
}
```

The one written in italics are comments and is not required to run the code. The process to work

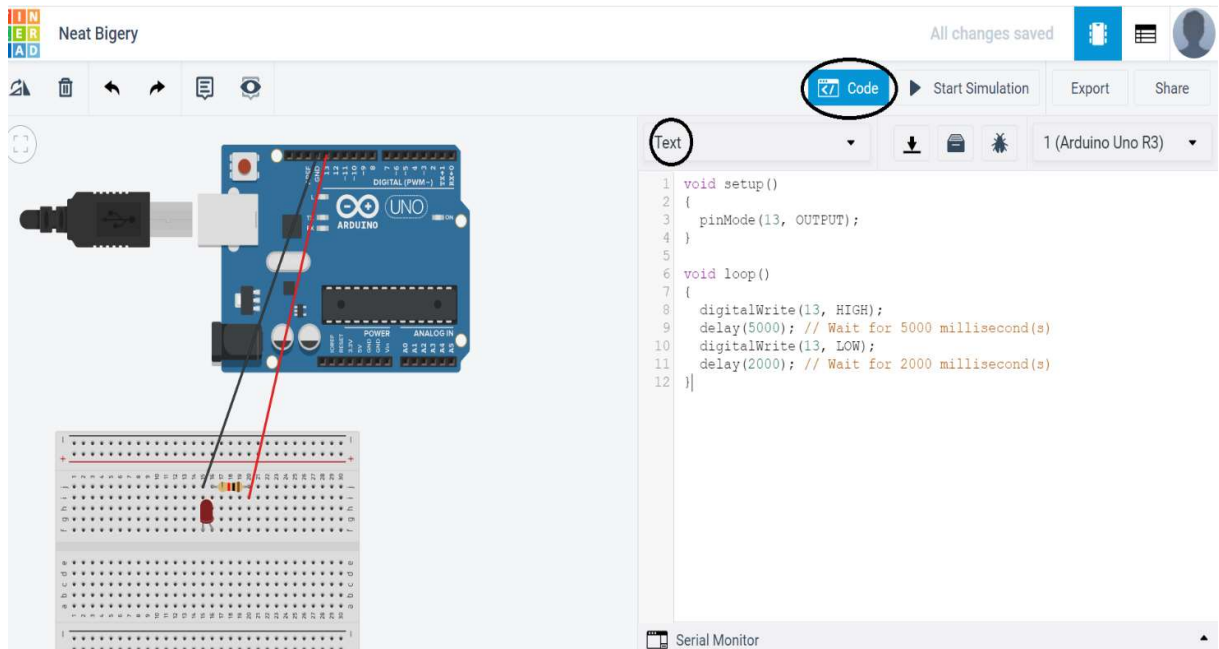
1. Drag the Arduino board from the components drop down.



2. Select the resistor of desired value (here 1 kilo ohm), 1 LED and breadboard as shown below. Make connection with Arduino PIN 13 (defined as OUTPUT PIN through the program described later) and PIN GND (ground).



3. Write the code as shown after clicking “Code” tab. Choose “Text” option as highlighted. The code defined PIN 13 as output. PIN 13 will be in HIGH state for 5 s and then LOW state for 2 s. Note that PIN 13 connecting wire has changed to RED and GND wire has changed to BLACK.



4. Execute the code by clicking “STRAT SIMULATION” Tab. You can notice LED turning ON for 5s and then turning OFF for 2s. Try changing the ON-OFF duration and observe the output.

The screenshot shows the TINKERCAD web interface. At the top, the username "Neat Bigery" is visible. The interface includes a toolbar with icons for zooming, deleting, undo, redo, and viewing the project. The "Simulator time" is displayed as 00:00:07. On the left, an Arduino Uno R3 is connected to a breadboard. A red wire connects the 5V pin of the Arduino to the positive rail of the breadboard. A black wire connects the GND pin of the Arduino to the negative rail of the breadboard. An LED is connected to the breadboard, with its anode to the positive rail and its cathode to the negative rail. On the right, the "Text" editor shows the following code:

```
1 void setup()
2 {
3   pinMode(13, OUTPUT);
4 }
5
6 void loop()
7 {
8   digitalWrite(13, HIGH);
9   delay(5000); // Wait for 5000 millisecond(s)
10  digitalWrite(13, LOW);
11  delay(2000); // Wait for 2000 millisecond(s)
12 }
```

Below the code editor is the "Serial Monitor" tab, which is currently empty.