Activity 4: Programming Embedded Systems (Part 1)

Activity 4 : Programming Embedded Systems (Having Fun with Arduino)

Group No : 14
Group Member :

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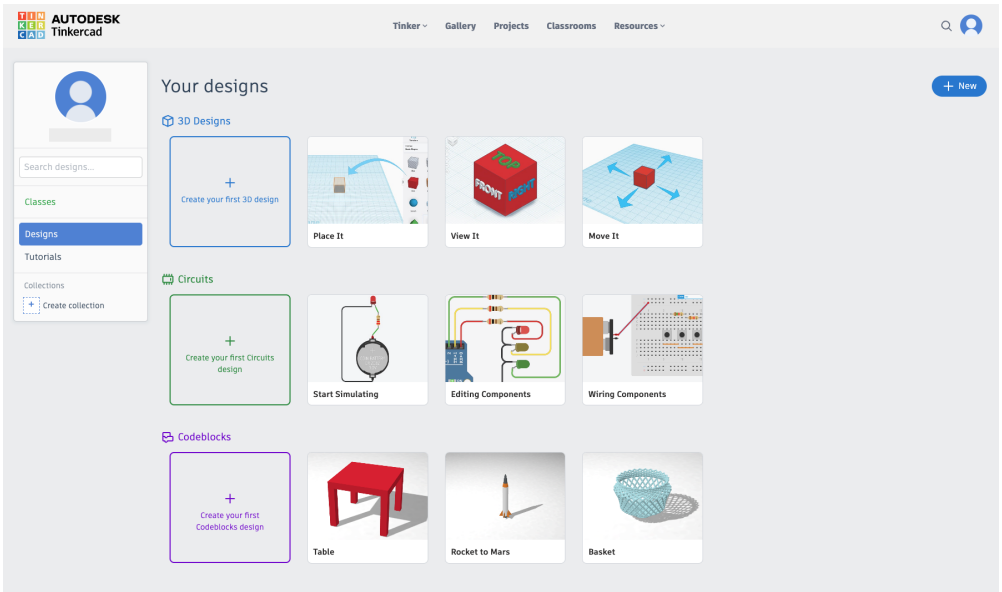
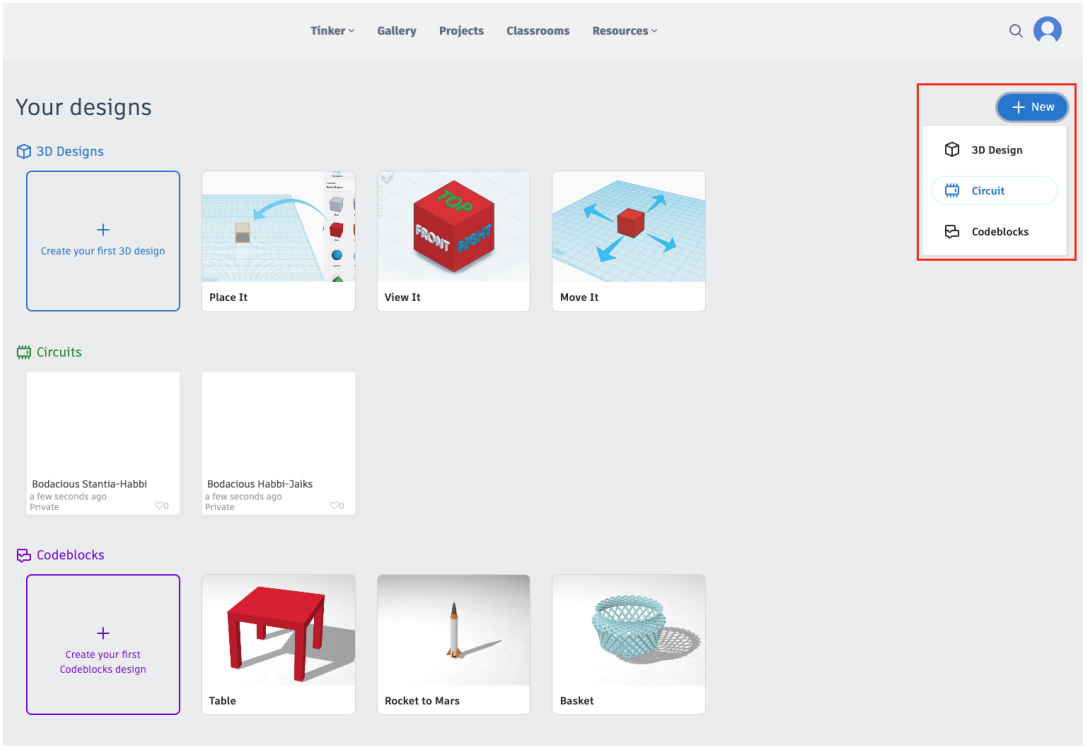
Part 0 : Preparation

- Go to https://www.tinkercad.com/. This website helps us to design 3D models and create simulated circuits. For this activity, we will create some basic circuits here.
- Login with your account. If you don't have your own account yet, you need to register first (By clicking at the "Sign Up" button on the upper right corner and then click "Create a personal account") or you may log in via Facebook / Google Account / etc.)
- After successfully creating an account / logging in, you should be redirected to https://www.tinkercad.com/dashboard. This is where you can view/manage your created projects.

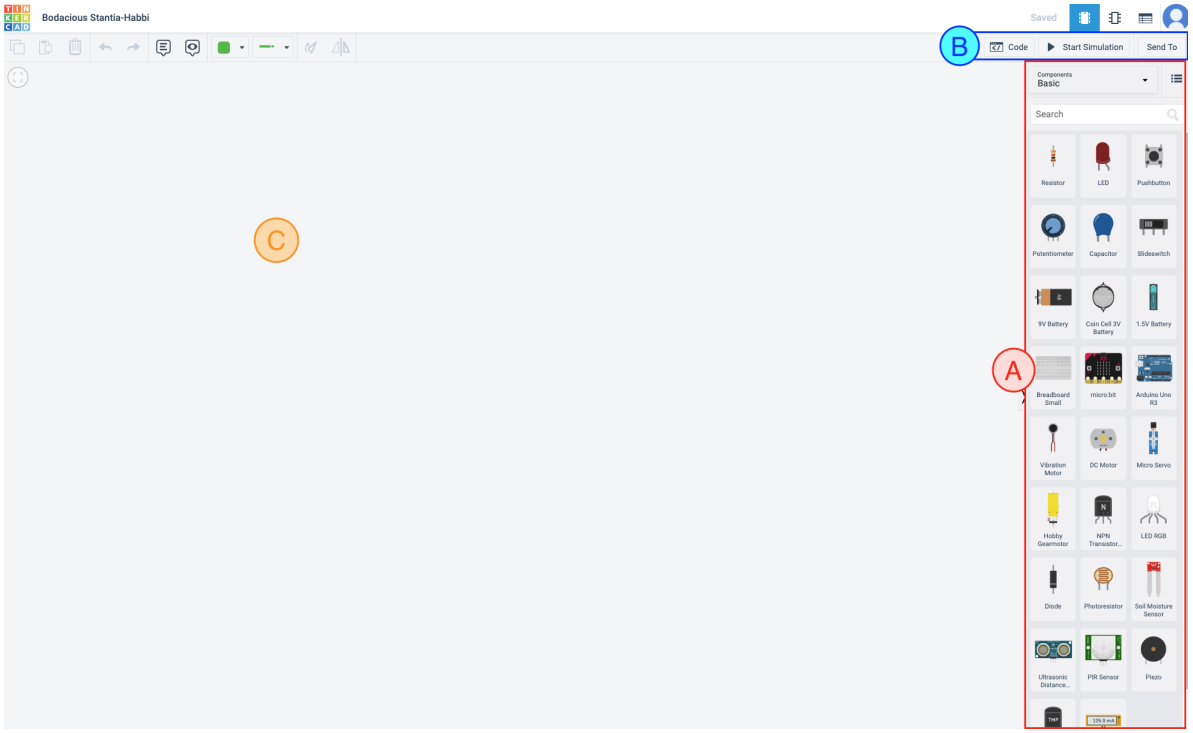


Activity 4: Programming Embedded Systems (Part 1)

- Next, we will begin the activity by creating our first circuit design. Click at the “New” button and then choose “Circuit” as shown in the figure below.



- You will be redirected to the workspace, this is the place where you are able to design your own circuit, code some programs in the programmable components and simulate them.



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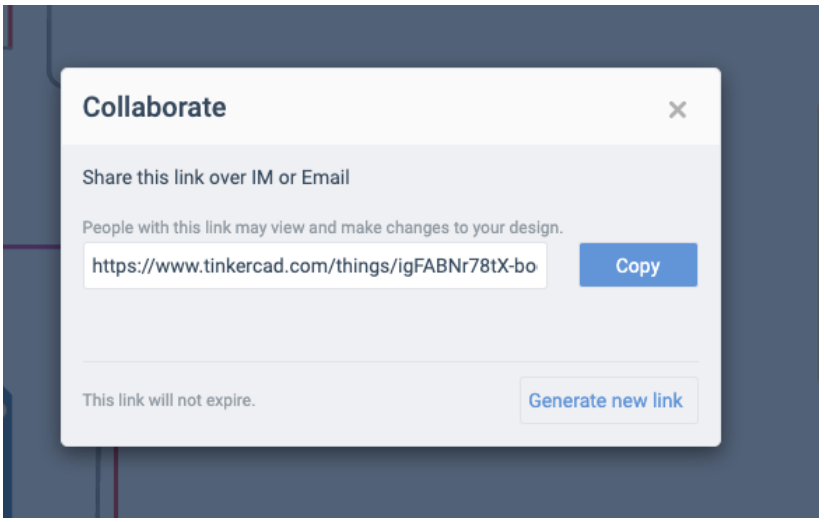
- On this page, you will find
  - **(A)** you can get the components that you need in your circuit here. For example, resistors, capacitors, LEDs and more.
  - **(B)** you can add your code to some programmable components (Code) and control your circuit simulation here. You can also click “Send To” > “Invite People” to get the link where you can share to your group members and **live-editing** with your group.



  - **(C)** your work area where you can create your circuit.

- Next, Drag and drop the following components from **(A)** to your work area. You should use the search bar to find your desired components more quickly.
  - 1 Breadboard
  - 1 Arduino UNO
  - 2 resistors
  - 1 LED
  - 1 push button
  - 1 oscilloscope

  Tips You can press CTRL and scroll your mouse at the work area in order to zoom in/out.

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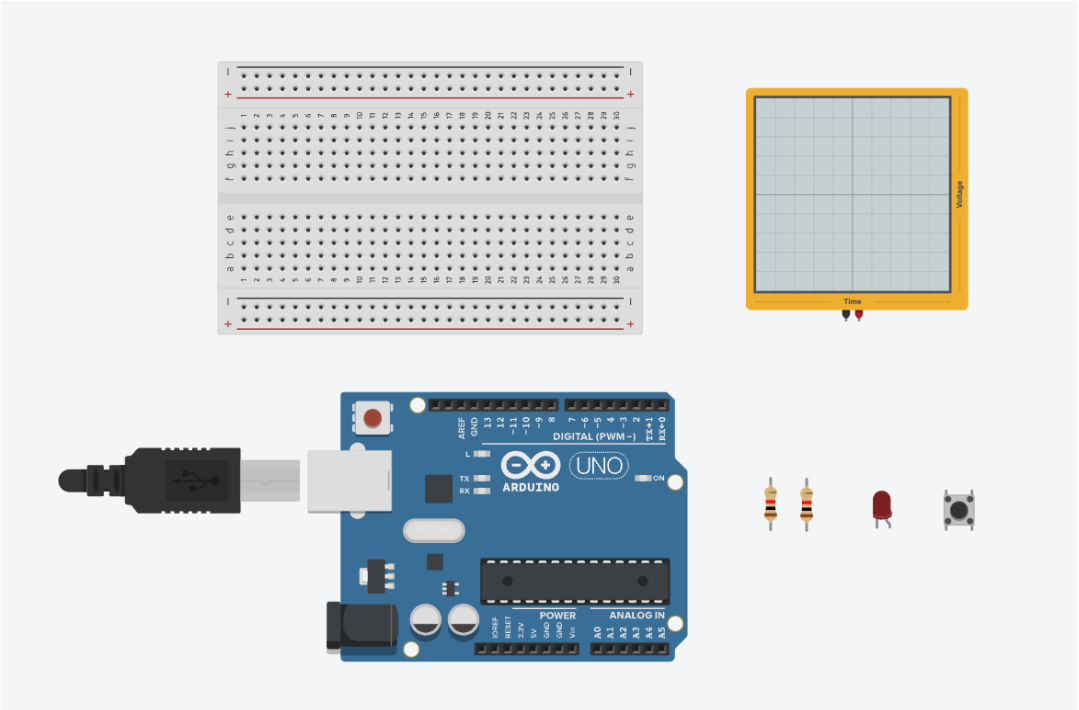


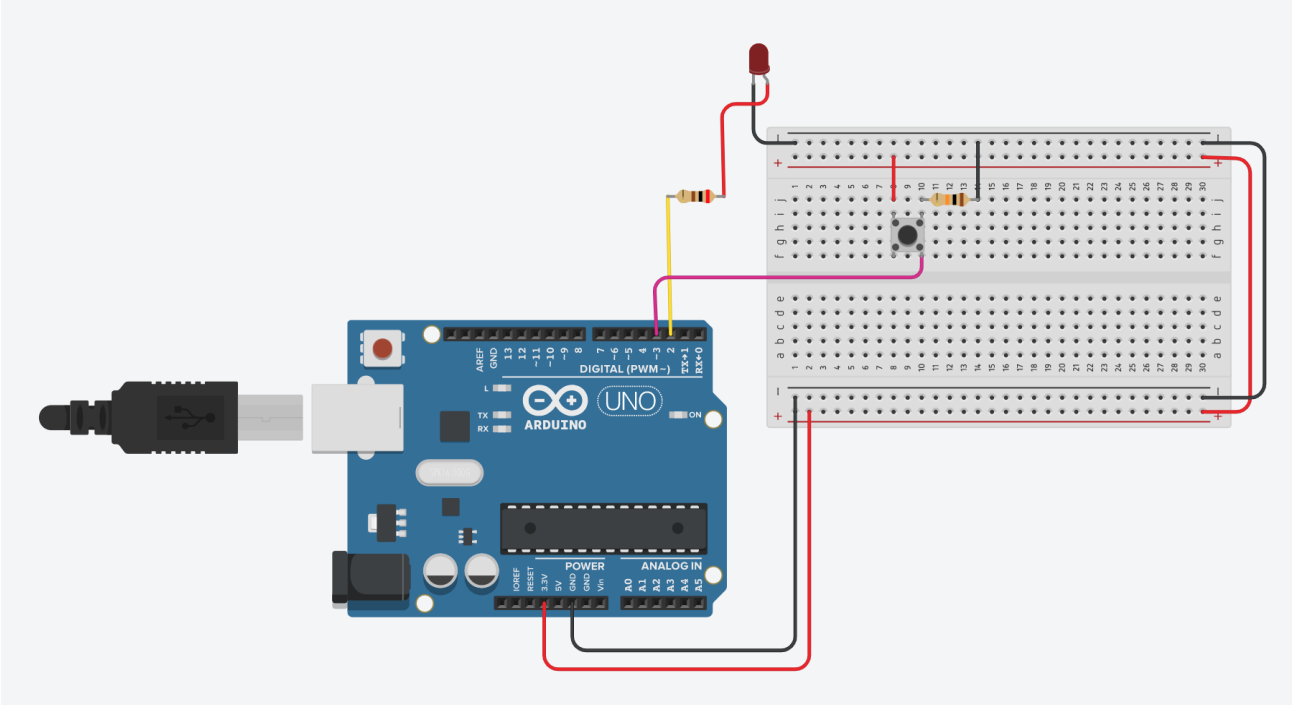
- Congratulations, once you reach here, it means that you have finished the Preparation Part. For the rest of the parts, answer the questions in the box given and submit this file (**.pdf format**) to myCourseVille.
- Once you finish each part, students must inform an instructor or a TA for inspection.

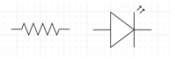
— THIS IS THE END OF PART 0 —

Activity 4: Programming Embedded Systems (Part 1)

Part 1 : Basic circuit and basic Arduino

Connect the circuit to the protoboard as shown in the figure. You can wiring by clicking and dragging between the devices you want to connect.



Draw the electrical circuit, use the electronics devices notation such as  . You may use draw.io on google drive or use your tablet to draw the circuit.

Tips For those who aren't familiar with how the breadboard connections work, you may find this link is useful for your better understanding.
https://www.sciencebuddies.org/science-fair-projects/references/how-to-use-a-breadboard

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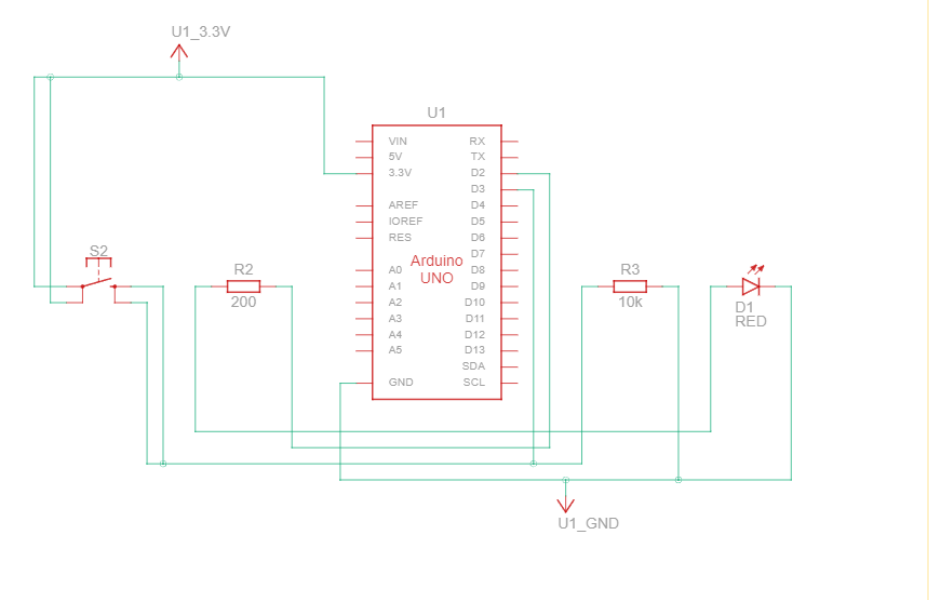

Try this code to see if your circuit is correct or not. You can **cut-and-paste** the code below.

```
int ledpin = 2;
int button = 3;
int buttonState = 0;

void setup()
{
  pinMode(ledpin, OUTPUT);
  pinMode(button, INPUT);
}

void loop()
{
  buttonState = digitalRead(button);
  if(buttonState == 1){
    digitalWrite(ledpin, HIGH);
  }
  if(buttonState == 0){
    digitalWrite(ledpin, LOW);
  }
}
```

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Explain what the code above does?

1. Set input(button) to D2
2. Set output(led) to D3
3. If button is clicked then lights the led, otherwise turn off the led

Write Arduino code to do the following task. Toggle the LED light when pushing the button. For example: 1) LED on -> push button -> LED off, 2) LED off -> push button -> LED on. Put the code in the answer box.

```
// C++ code
//
int ledpin = 2;
int button = 3;
int buttonState = 0;
int lastButtonState = 0;
int count = 0;

void setup() {
  pinMode(ledpin, OUTPUT);
  pinMode(button, INPUT_PULLUP);
  digitalWrite(ledpin, LOW);
}

void loop() {
  buttonState = digitalRead(button);
  if (buttonState != lastButtonState && buttonState == HIGH) {
    digitalWrite(ledpin, count % 2 == 0 ? HIGH : LOW);
    count++;
  }
  lastButtonState = buttonState;
  delay(50);
}
```

— THIS IS THE END OF PART 1 —