**EST Practical Activity Report Submitted for**

**ENGINEERING DESIGN-II (UTA024)**

**Submitted by:**

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**BE Second Year** **Group – 2CO5**

Submitted to:

**Dr. Niyaz Ahmad Wani**



## Computer Science and Engineering Department TIET, Patiala

Jan-May 2024

# DECLARATION

We declare that this project report is based on our own work carried out during the course of our study in our Engineering-design II Computer Lab under the supervision of Dr Niyaz Ahmad Wani.

We assert that the statements made and conclusions drawn are an outcome of our own research work.

We further certify that the work contained in this report is original and has been done by us under the general supervision of our supervisor.

We have followed the guidelines provided by the University in writing this report.

We also declare that this project is the outcome of our own effort, that it has not been submitted to any other university for the award of any degree.

# INDEX

|  |  |  |
| --- | --- | --- |
| S. No. | Name of Experiments | Page No. |
| 1. | Introduction to Arduino Micro-Controller. | 5-6 |
| 2. | To make a circuit of blinking an LED using Arduino Uno  and breadboard. | 7-10 |
| 3. | To blink multiple LEDs using Arduino Uno and breadboard. | 11-14 |
| 4. | Write a program to design a pattern of sequence of multiple  LED’s using for loop in Arduino. | 15-18 |
| 5. | Write a program to demonstrate sending data from the computer to the Arduino board and control brightness of  LED. | 19-23 |
| 6. | *Serial Communication:*  WAP to print following pattern using for loop.  \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  \*  \*\*\*\* Roll No.  \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Name:  \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Branch:  \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* | 24-28 |

|  |  |  |
| --- | --- | --- |
| 7. | Write a program to change the intensity of the given LED’s for the sequence 35214 in for both forward and reverse  order. | 35-39 |
| 8. | Write a program to demonstrate control of DC Motor using forward, backward, left, right turn motion and clock-  wise/anti clock- wise rotation. |  |
| 9. | Write a program to read values of IR Sensor using analog and digital read and convert buggy into normal line follower  robocar |  |
| 10. | To demonstrate the use of ultrasonic sensor by integrating line follower robocar with obstacle avoidance capability. |  |
| 11. | Write a program --   1. To read the pulse width of gantry transmitter and trigger stop buggy function by detecting individual gantry. 2. To demonstrate X-bee module communication between   two PCs using X-CTU. |  |
| 12. | Bronze Challenge: Single buggy around track twice in clockwise direction, under full supervisory control. Buggy can detect an obstacle, Parks safely. Prints state of the track  and buggy at each gantry stop. |  |
|  |  |  |

## EXPERIMENT-1

**OBJECTIVE:** Introduction to Arduino Micro-Controller.

**SOFTWARE USED:** Tinkercad Simulator

### HARDWARE USED:

|  |  |  |
| --- | --- | --- |
| **Sr. No** | **Name of Components** | **Value** |
| **1.** | Arduino Uno Micro-Controller | 1 |

**LOGIC/CIRCUIT DIAGRAM**



Theory -

The **Arduino Uno** is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc and initially released in 2010.

The board is equipped with sets of digital and analog [input/output](https://en.wikipedia.org/wiki/Input/output) (I/O) pins that may be interfaced to various [expansion boards](https://en.wikipedia.org/wiki/Expansion_board) (shields) and other circuits. The board has 14 digital I/O pins (six capable of [PWM](https://en.wikipedia.org/wiki/Pulse-width_modulation) output), 6 analog I/O pins, and is programmable with the [Arduino IDE](https://en.wikipedia.org/wiki/Arduino#Software) (Integrated Development Environment), via a type B [USB cable](https://en.wikipedia.org/wiki/USB_cable). It can be powered by the USB cable or by an external [9-volt battery,](https://en.wikipedia.org/wiki/9-volt_battery) though it accepts voltages between 7 and 20 volts.

1. Power USB: Arduino board can be provided power from PC/laptop using power cable
2. Power Jack: Arduino can be powered directly from the AC power supply.
3. Reset Button: It is used to reset the Arduino board i.e., start programming from beginning.
4. Pins: Used to connect different components to the Arduino board, voltage and ground connections.
5. Analog Pins: Used to read analog signals from analog sensors and converts it into digital signal.
6. Digital Pins: These pins can be configured to work a input or output pins to read logics (0 and 1).
7. Power Pins: Pins that provide power (operating voltage) and ground connections.
8. ATmega328P Microcontroller: It is a high performance yet low power consumption 8-bit AVR microcontroller. It can be commonly found in Arduino boards such as Arduino Uno. It is also known as the brain of Arduino.

### RESULT ANALYSIS

In this experiment, we get to know about basics of Arduino Uno Microcontroller and its various functions and components.

**EXPERIMENT 2**

**OBJECTIVE:** Write a program to blink a single LED using Arduino and breadboard.

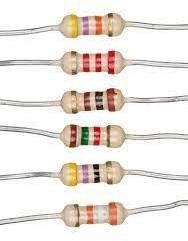
**SOFTWARE USED:** Tinkercad Simulator.

### HARDWARE USED:

|  |  |  |
| --- | --- | --- |
| **Sr No.** | **Name of the Component** | **Value** |
| 1. | Arduino Uno Board | 1 |
| 2. | Breadboard | 1 |
| 3. | Jumper Wires | 2 |
| 4. | LED | 1 |
| 5. | Resistor | 220 ohm |

**THEORY:**

* + **Resistor:** Resistors are used in virtually all electronic circuits and many electrical ones. Resistors, as their name indicates resist the flow of electricity and this function is key to the operation most circuits.



* + **LED:** A light-emitting diode (LED) is a semiconductor light source that emits light when

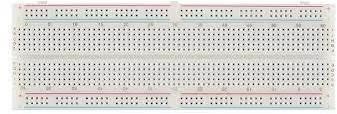
current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons (Energy packets).



* + **Arduino Uno Board:** The **Arduino Uno** is an [open-source](https://en.wikipedia.org/wiki/Open-source) [microcontroller board](https://en.wikipedia.org/wiki/Microcontroller_board) based on the [Microchip](https://en.wikipedia.org/wiki/Microchip_Technology) [ATmega328P](https://en.wikipedia.org/wiki/ATmega328P) microcontroller and developed by [Arduino.cc.](https://en.wikipedia.org/wiki/Arduino)



* + **Breadboard:** A breadboard is used to place components (resistor, capacitor, LED’s etc.) that are wired together. It is used to make temporary circuits.



* + **Jumper Wires:** A jumper wire is an electric wire that connects remote electric circuits used for printed circuit boards.



**TINKERCAD DIAGRAM:**

|  |
| --- |
| A screenshot of a computer  Description automatically generated  Code -  void setup()  {  pinMode(13, OUTPUT);  }  void loop()  {  digitalWrite(13, HIGH);  delay(1000); // Wait for 1000 millisecond(s)  digitalWrite(13, LOW);  delay(1000); // Wait for 1000 millisecond(s)  }  **RESULTS:**  In this experiment, we learnt how to blink an LED using Arduino Uno. |

**EXPERIMENT 3**

**OBJECTIVE:** Write a program to blink multiple LEDs using Arduino Uno and breadboard.

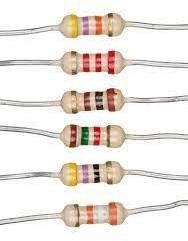
**SOFTWARE USED:** Tinkercad Simulator.

### HARDWARE USED:

|  |  |  |
| --- | --- | --- |
| **Sr No.** | **Name of the Component** | **Value** |
| 1. | Arduino Uno Board | 1 |
| 2. | Breadboard | 1 |
| 3. | Jumper Wires | 2 |
| 4. | LED | 1 |
| 5. | Resistor | 220 ohm |

**THEORY:**

* + **Resistor:** Resistors are used in virtually all electronic circuits and many electrical ones. Resistors, as their name indicates resist the flow of electricity and this function is key to the operation most circuits.



* + **LED:** A light-emitting diode (LED) is a semiconductor light source that emits light when

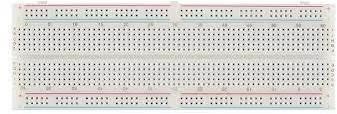
current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons (Energy packets).



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**TINKERCAD DIAGRAM:**

|  |
| --- |
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| **RESULTS:**  In this experiment, we learnt how to blink multiple LEDs simultaneously using Arduino Uno.  A computer keyboard with wires connected to a circuit board  Description automatically generated  A computer with wires connected to a circuit board  Description automatically generated |

**EXPERIMENT 4**

**OBJECTIVE:** Write a program to design a pattern of sequence of multiple

LED’s using for loop in Arduino (binary sequence).

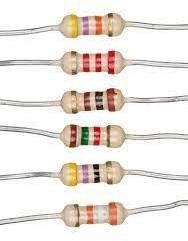
**SOFTWARE USED:** Tinkercad Simulator.

### HARDWARE USED:

|  |  |  |
| --- | --- | --- |
| **Sr No.** | **Name of the Component** | **Value** |
| 1. | Arduino Uno Board | 1 |
| 2. | Breadboard | 1 |
| 3. | Jumper Wires | 2 |
| 4. | LED | 4 |
| 5. | Resistors | 4 (220 ohm) |

**THEORY:**

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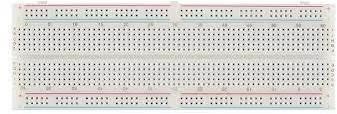
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**TINKERCAD DIAGRAM:**

|  |
| --- |
| A screenshot of a computer  Description automatically generated  Code -  void setup()  {  pinMode(10, OUTPUT);  pinMode(11, OUTPUT);  pinMode(12, OUTPUT);  pinMode(13, OUTPUT);  }  void loop()  {  int a, b, c, d;  int i;  for (i=0; i<16; i++)  {  a=i%2;  b=(i/2)%2;  c=(i/4)%2;  d=(i/8)%2;  if (a==1)  digitalWrite(10, HIGH);  else  digitalWrite(10, LOW);  if (b==1)  digitalWrite(11, HIGH);  else  digitalWrite(11, LOW);  if (c==1)  digitalWrite(12, HIGH);  else  digitalWrite(12, LOW);  if (d==1)  digitalWrite(13, HIGH);  else  digitalWrite(13, LOW);  delay(1000);  }  }  **RESULTS:**  In this experiment, we learnt how to blink multiple LEDs in a defined pattern in the order of binary sequence using Arduino Uno. |

**EXPERIMENT 5**

**OBJECTIVE:** Write a program to demonstrate sending data from the computer to the Arduino board and control brightness of LED.

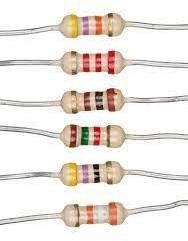
**SOFTWARE USED:** Tinkercad S imulator.

### HARDWARE USED:

|  |  |  |
| --- | --- | --- |
| **Sr No.** | **Name of the Component** | **Value** |
| 1. | Arduino Uno Board | 1 |
| 2. | Breadboard | 1 |
| 3. | Jumper Wires | 2 |
| 4. | LED | 4 |
| 5. | Resistors | 4 (220 ohm) |

**THEORY:**

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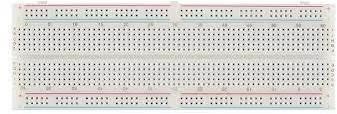
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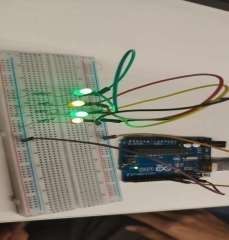


* + **Jumper Wires:** A jumper wire is an electric wire that connects remote electric circuits used for printed circuit boards.



**TINKERCAD DIAGRAM:**

|  |
| --- |
| A screenshot of a computer  Description automatically generated  Code -  void setup()  {  Serial.begin(9600);  pinMode(10, OUTPUT);  pinMode(11, OUTPUT);  pinMode(12, OUTPUT);  pinMode(13, OUTPUT);  pinMode(9, OUTPUT);  }  void loop()  {  int a, b, c, d, e;  int i;  Serial.println("enter intensity");  a=Serial.parseInt();  analogWrite(9,a);  delay(2000);  analogWrite(9,0);  delay(1000);  Serial.println("enter intensity");    b=Serial.parseInt();  analogWrite(10, b);  delay(1000);  analogWrite(10,0);  delay(1000);  Serial.println("enter intensity");  c=Serial.parseInt();  analogWrite(11,c);  delay(2000);  analogWrite(11,0);  delay(1000);  Serial.println("enter intensity");  d=Serial.parseInt();  analogWrite(12,d);  delay(2000);  analogWrite(12,0);  delay(1000);  Serial.println("enter intensity");  e=Serial.parseInt();  analogWrite(13,e);  delay(2000);  analogWrite(13,0);  delay(1000);  }  **RESULTS:**  In this experiment, we learnt how to change brightness of LED by giving intensity as input using Arduino Uno. |



**EXPERIMENT 6**

**OBJECTIVE:** Write a programto print pattern using for loop through serial communication.

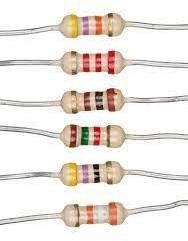
**SOFTWARE USED:** Tinkercad Simulator.

### HARDWARE USED:

|  |  |  |
| --- | --- | --- |
| **Sr No.** | **Name of the Component** | **Value** |
| 1. | Arduino Uno Board | 1 |
| 2. | Breadboard | 1 |
| 3. | Jumper Wires | 2 |
| 4. | LED | 4 |
| 5. | Resistors | 4 (220 ohm) |

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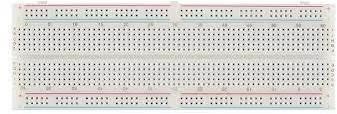
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**TINKERCAD DIAGRAM:**

A blue circuit board with black dots and buttons

Description automatically generated

|  |
| --- |
| Code -  void setup(){  Serial.begin(9600);}  void loop()  { int i;  for (i=1; i<=10; i++)  Serial.print("\*");  Serial.println("\nRoll no");  for (i=1; i<=10; i++)  Serial.print("\*");  Serial.println("\nName");  for (i=1; i<=10; i++)  Serial.print("\*");  Serial.println("\nBranch");  for (i=1; i<=10; i++)  Serial.print("\*");  while(1){}  }  **RESULTS:**  In this experiment, we learnt how to print given pattern through serial communication using Arduino Uno. |

**EXPERIMENT 7**

**OBJECTIVE:** Write a program to change the intensity of given LED’s for the sequence 35214 in for both forward and reverse order.

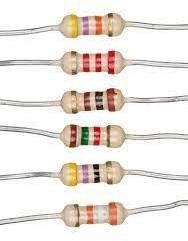
**SOFTWARE USED:** Tinkercad Simulator.

### HARDWARE USED:

|  |  |  |
| --- | --- | --- |
| **Sr No.** | **Name of the Component** | **Value** |
| 1. | Arduino Uno Board | 1 |
| 2. | Breadboard | 1 |
| 3. | Jumper Wires | As per requirement |
| 4. | LED | 5 |
| 5. | Resistors | 4 (220 ohm) |

**THEORY:**

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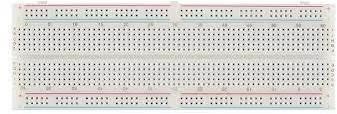
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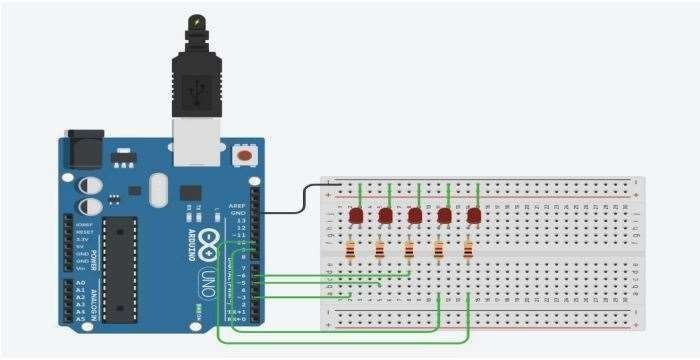
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* + **Jumper Wires:** A jumper wire is an electric wire that connects remote electric circuits used for printed circuit boards.



**TINKERCAD DIAGRAM:**



|  |
| --- |
| Code –  void setup() {  // put your setup code here, to run once:  Serial.begin(9600);  pinMode(10,OUTPUT);  }  void loop() {  // put your main code here, to run repeatedly:  for(int i=1;i<=5;i++)  {  switch(i)  {  case(1):  {  analogWrite(6,150);  delay(1000);  digitalWrite(6,LOW);  break;  }  case(2):  {  analogWrite(10,250);  delay(1000);  digitalWrite(10,LOW);  break;  }  case(3):  {  analogWrite(5,100);  delay(1000);  digitalWrite(5,LOW);  break;  }  case(4):  {  analogWrite(3,50);  delay(1000);  digitalWrite(3,LOW);  break;  }  case(5):  {  analogWrite(9,200);  delay(1000);  digitalWrite(9,LOW);  }  }  delay(1000);  }  for(int i=5;i>=1;i--)  {  switch(i)  {  case(1):  {  analogWrite(6,150);  delay(1000);  digitalWrite(6,LOW);  break;  }  case(2):  {  analogWrite(10,250);  delay(1000);  digitalWrite(10,LOW);  **RESULTS:**  In this experiment, we learnt how to print given pattern through serial communication using Arduino Uno. |

