# MES zero project report

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| Roll # | 221763 |
| SUBJECT | Microcontroller&Emadded System |
| DATE | 1st Mar, 2025. |
| SUBMITTED TO | Engr. Sadia Saeed |

# Problem Statement

Arduino is an open-source electronics platform used for creating interactive projects. Users often face challenges in programming and troubleshooting hardware components, hindering seamless project development. Improving accessibility, documentation, and community support can enhance the overall user experience with Arduino.

# Objective:

The objective of Arduino, a popular open-source hardware and software platform, is to make it easy for individuals, hobbyists, and professionals to create interactive and programmable electronic projects.

Arduino boards are equipped with microcontrollers, and the platform provides a simple and flexible environment for writing and uploading code to these boards.

# Introduction:

The Custom Design Arduino Uno Project aimed to create a personalized version of the Arduino Uno microcontroller board to meet specific project requirements. The Arduino Uno is a popular open-source microcontroller board widely used for various electronic projects due to its simplicity and versatility. However, in certain scenarios, customization may be necessary to accommodate specific functionalities or constraints. This project outlines the process of designing and implementing a customized Arduino Uno board tailored to the project's needs.

# Components:

# Atmega 328 P:

**The ATmega328P is a popular microcontroller chip manufactured by Atmel (now part of Microchip Technology). It belongs to the AVR family of microcontrollers and is widely used in various embedded systems and DIY electronics projects. Here are some key features and**

**information about the ATmega328P:.analog-to-digital converters and serial communication interfaces, the ATmega328P is ideal for a wide range of embedded .applications.**

# Catalytic capacitor:

These Capacitors in an Arduino Uno help stabilize the power supply, filter out noise, and ensure smooth operation of the microcontroller. They prevent voltage fluctuations, improve clock stability, and play a role in the reset circuit to avoid accidental resets. These components are essential for maintaining reliable performance in electronic circuits.

# Resistor:.

. A resistor is an electronic component that limits or controls the flow of electric current in a circuit. It is designed to have a specific resistance, . measured in ohms (Ω). The resistance of a resistor is determined by its physical characteristics, such as length, cross-sectional area, and the material

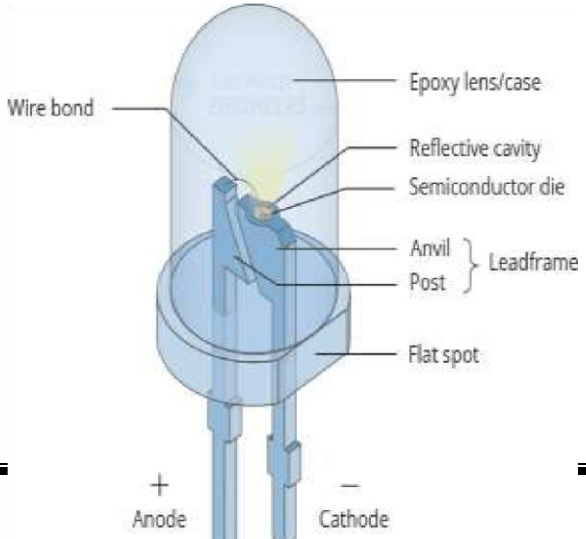
## Capacitor:

A capacitor is a two-terminal electrical device that can store energy in the form of an electric charge. It consists of two electrical conductors that are separated by a distance. The space between the conductors may be filled by vacuum or with an insulating material known as a dielectric.

## LED:

A light-emitting diode (LED) is a semiconductor device that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons.

a form of electrical connector



## Headers:

A pin header (or simply header) is .
A male pin header consists of one or more rows of metal pins molded into a plastic base, often 2.54 mm (0.1 in) apart, though available in many spacings.
Male pin headers are costeffective due to their simplicity.

# Methology:

## Requirement Analysis:

Identify the specific requirements of the Arduino Uno project, including the desired size, layout, and functionality of the PCB board.

Determine the components to be included on the PCB, such as the ATmega328P microcontroller, voltage regulator, and connectors.

## Schematic Design:

Create a schematic diagram using electronic design software (e.g., Eagle, KiCad) that illustrates the connections between components on the PCB.

Ensure proper placement of components and adherence to the Arduino Uno schematic for compatibility and functionality.

## Simulation:

Utilize simulation software (e.g., LTSpice, Proteus) to simulate the behavior of the circuit designed in the schematic.
Verify the functionality and performance of the PCB design through simulations, identifying and resolving potential issues before prototyping.

## PCB Layout:

Translate the schematic into a PCB layout, arranging the components on the board and routing the traces to establish electrical connections.

Consider factors such as signal integrity, power distribution, and component placement to optimize performance and reliability.

## Component Placement:

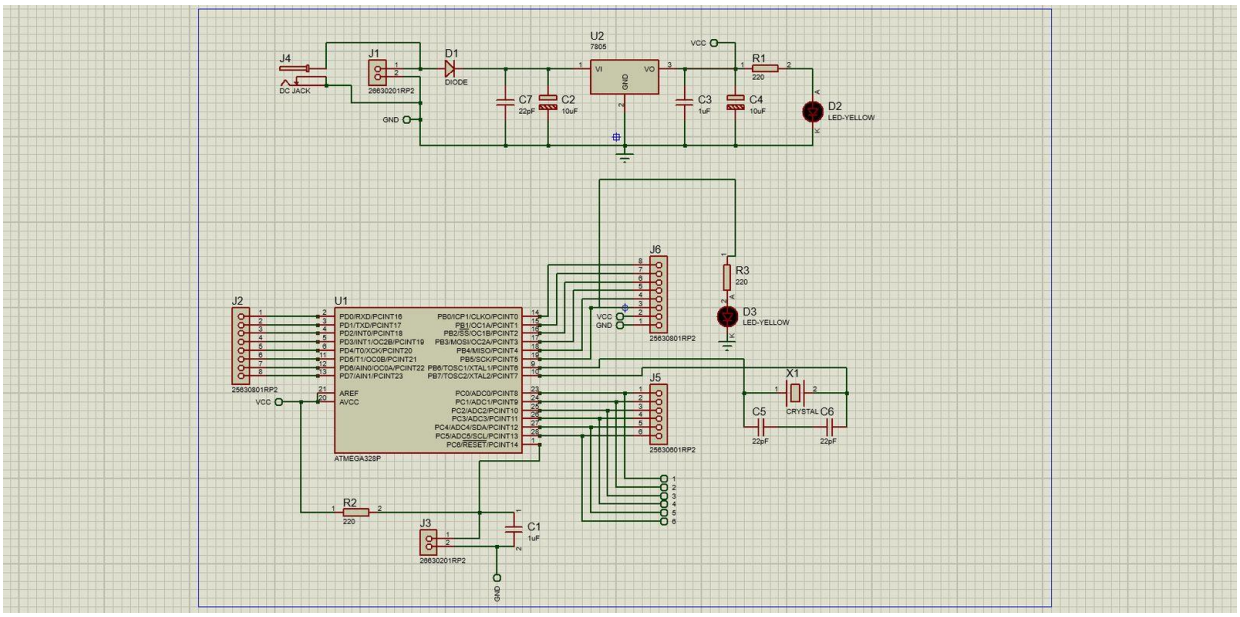
Place components strategically on the PCB to minimize signal interference, shorten trace lengths, and optimize space utilization.

Group related components together and orient them for ease of assembly and troubleshooting. Prototyping:

Fabricate a prototype PCB to verify the design and functionality before mass production.

Conduct thorough testing to ensure proper operation and compatibility with Arduino Uno software and peripherals.

# Schematic:


U2
7805
VCC
R1
220
J4
DC JACK
J1
26630201RP2
D1
DIODE
GND
C7
22pF
C2
10uF
C3
1uF
C4
10uF
D2
LED-YELLOW
J6
R3
220
D3
LED-YELLOW
J2
U1
J5
X1
CRYSTAL
C5
22pF
C6
22pF
ATMEGA328P
R2
220
J3
C1
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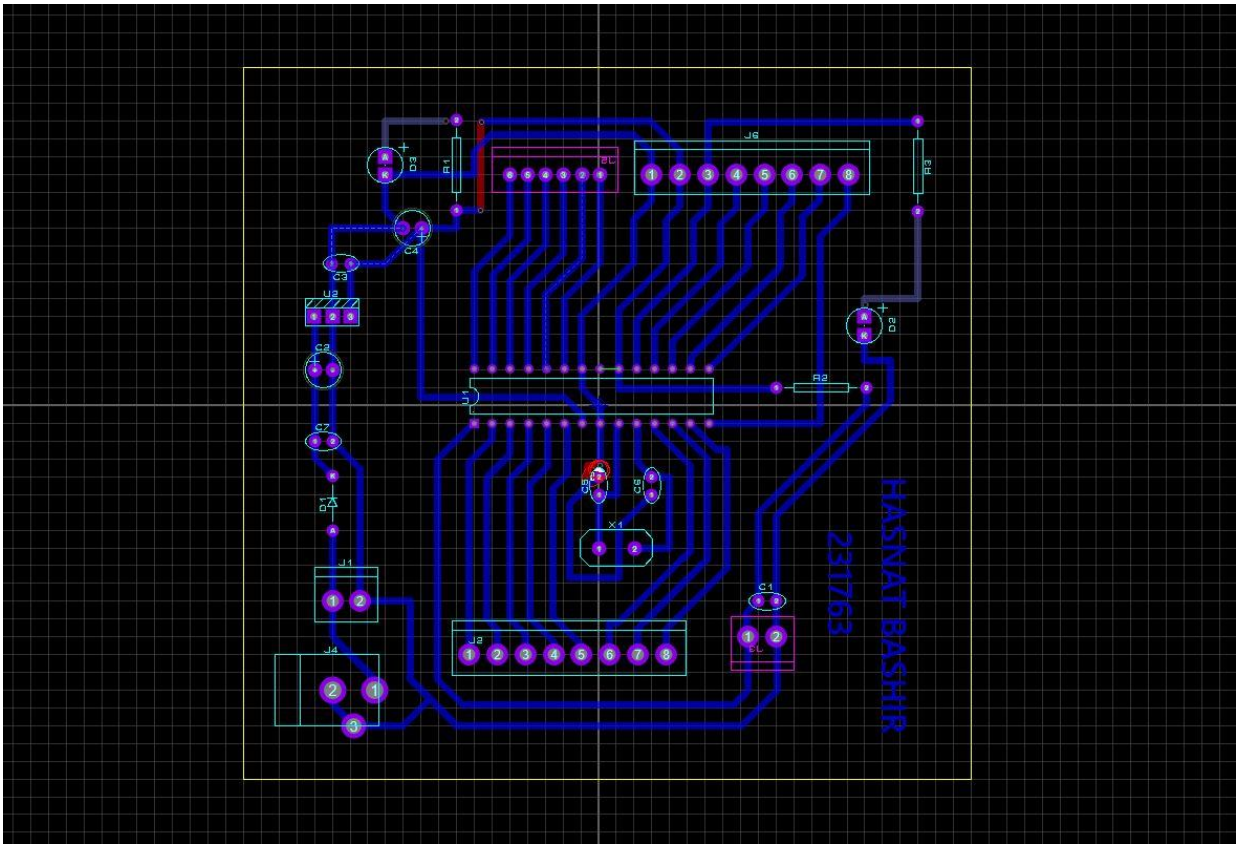
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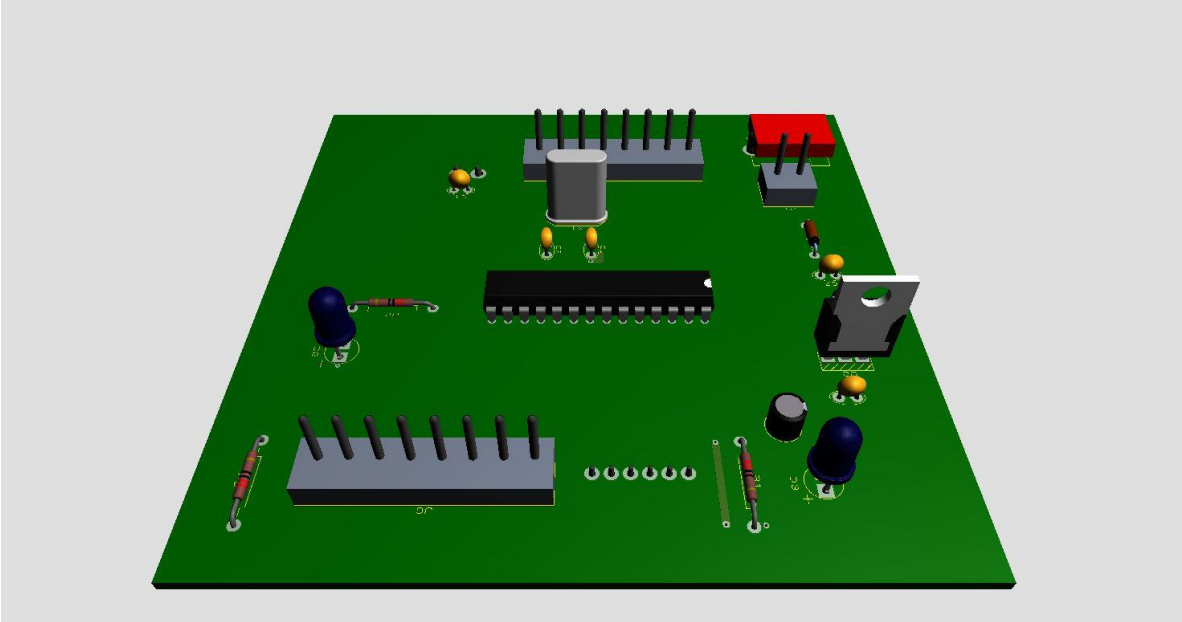
# 3-D View:

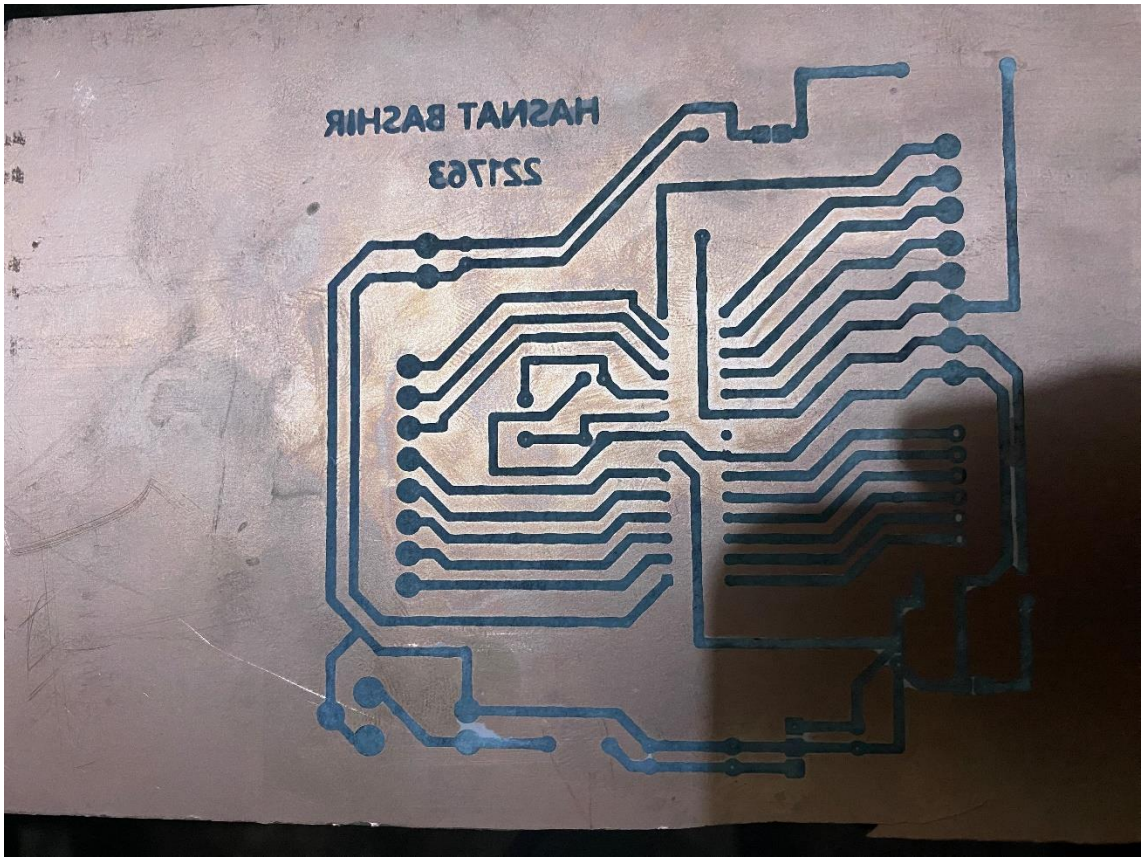


# Working:

Arduino is an open -source electronics platform that consists of both hardware and software components. It is designed to be easy to use, making it accessible for beginners and hobbyists, yet powerful enough for more advanced projects. Here's a brief overview of how Arduino works:

1. **Hardware:**
   - **Microcontroller:** At the heart of an Arduino board is a microcontroller, which is a programmable chip that acts as the brain of the system. The most common microcontroller used in Arduino boards is the Atmel AVR series or ARM architecture-based microcontrollers.
   - **Input/Output (I/O) Pins:** Arduino boards have a set of digital and analog pins that can be used to read inputs (like sensors) or control outputs (like LEDs or motors).
   - **Power Supply:** Arduino boards can be powered using USB, batteries, or an external power source.

# PCB & Hardware




# Cost Analysis

- Atmega 328 P x 1 (950pkr)
- Resistors x 7 (20pkr)
- Capacitors x 2 (10pkr)
- Power Jack x 1 (20pkr)
- LED x 2 (10pkr)
- Push Button x 1 (5pkr)  1n4007 x 1 (2pkr)
- 8 pin and 6 pin connector x2(100pkr)
- Diode x1 (5pkr)

- # Failures:
- As such I don’t face any failure in this design but I make a numbers of iteration in schematic of this design because I draw it
- # Conclusions:
- The Arduino Uno custom design project successfully addressed specific project requirements by tailoring the microcontroller board to meet unique functionalities. Through meticulous design and implementation, the custom board exhibited reliable performance and compatibility with standard Arduino software libraries and tools. This project underscores the importance of flexibility and adaptability in electronic design, offering valuable insights into customizing microcontroller boards for diverse applications. The outcomes contribute to the maker community's knowledge base, fostering innovation and creativity in electronic prototyping and development. Future iterations could further explore customization options and collaborations to enhance the project's impact and capabilities.

# Thank you