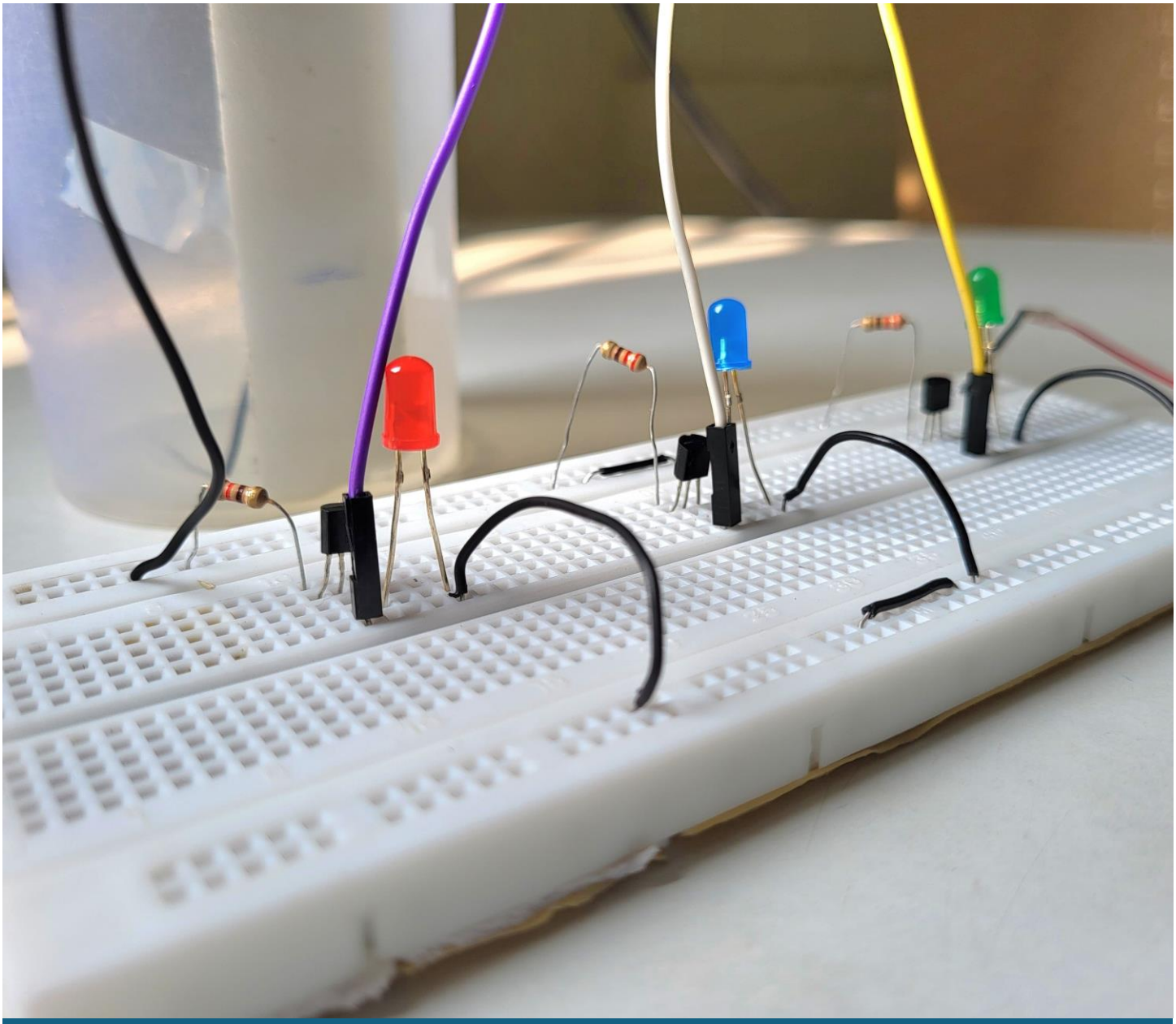

Water Level Indicator

ECE Workshop Project

ECE-1 11/12/24 EC103

DELHI TECHNOLOGICAL UNIVERSITY

(Formerly Delhi College of Engineering)
Shahbad Daulatpur, Bawana Road, Delhi 110042

Course Code: EC-103

Submitted To:
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ECE-1
1st Year, Semester I

Date: - 12 November 2024

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Introduction

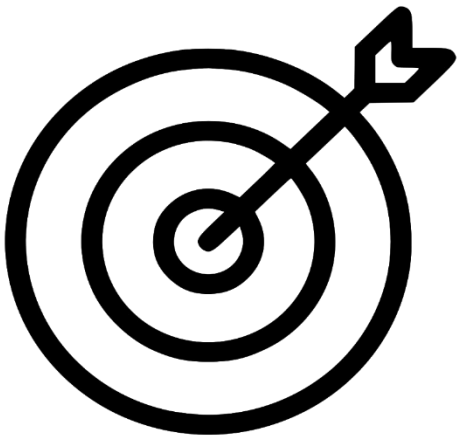
Water is an essential resource, and its efficient management is crucial in various applications, including household water tanks, industrial water storage systems, and agricultural irrigation systems. Monitoring the water level in these tanks is vital to prevent both overflow and depletion, ensuring optimal usage and conservation of water. The water level indicator project addresses this need by providing a simple, cost-effective, and reliable solution for real-time water level monitoring.

This project utilizes basic electronic components such as transistors, resistors, LEDs, and a 9V battery to create a water level indicator circuit. The project is designed with three distinct levels of water indication, each represented by an LED. As the water level rises sequentially, the LEDs light up one by one, indicating the low, medium, and high levels of water in the tank. This sequential activation of LEDs provides an intuitive and easy-to-understand visual representation of the water level.

The simplicity and effectiveness of this design make it an ideal solution for various applications where water level monitoring is required. Additionally, the project offers an excellent opportunity for learning and understanding fundamental electronic principles, including the operation of transistors, the role of resistors in limiting current, and the practical application of basic circuit design.

Overall, this water level indicator project not only helps in efficient water management but also serves as an educational tool for those interested in exploring electronics and practical circuit implementation.

Objectives



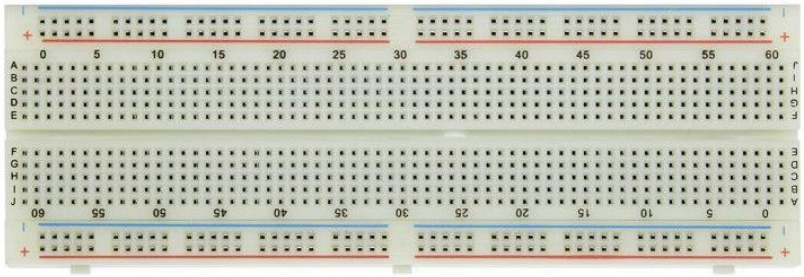
1. **Efficient Water Management**:
    - To create a reliable system that provides real-time monitoring of water levels in tanks, thus preventing both overflow and depletion.
2. **Cost-Effective Solution**:
    - To design a low-cost and easily implementable circuit using basic electronic components, making it accessible for a wide range of applications.
3. **Educational Value**:
    - To provide a practical learning opportunity for understanding fundamental electronic principles, such as the operation of transistors, the role of resistors, and basic circuit design.
4. **Visual Feedback Mechanism**:
    - To implement a clear and intuitive visual indication system using LEDs, which helps users easily monitor the water level at a glance.
5. **User-Friendly Design**:

- To develop a straightforward and user-friendly water level indicator that can be easily set up and maintained without requiring advanced technical skills.

Components Used

Breadboard:

- A breadboard is an essential tool for prototyping and building electronic circuits without soldering. It consists of a grid of interconnected holes where components and wires can be easily inserted and connected. The breadboard's design allows for quick modifications and troubleshooting, making it ideal for testing and refining circuit designs.



BC547 NPN Transistors:

- The BC547 is a versatile NPN bipolar junction transistor (BJT) commonly used in low-power electronic circuits for switching and amplification. When a small current is applied to the base, it allows a larger current to flow between the collector and emitter, effectively acting as an electronic switch.
- **Voltage Ratings**:

- Collector-Emitter Voltage (Vceo): 45V
- Collector-Base Voltage (Vcbo): 50V

- **Current Ratings**:
  - Collector Current (Ic): 100mA
- **Applications**: Used for switching and amplifying small signals in various electronic projects.

220 Ohm Resistors:

- Resistors are passive electronic components that limit the flow of electric current in a circuit. The 220-ohm resistors in this project are used to protect the LEDs by ensuring they receive the appropriate amount of current, preventing them from being damaged by excessive current.
- **Power Rating**: Typically, 1/4 Watt (0.25W)
- **Resistance**: 220 ohms
- **Applications**: Current limiting and voltage division in electronic circuits.

Jumper Wires and Connecting Wires:

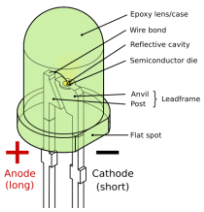
- Jumper wires are flexible electrical wires used to connect components on a breadboard or other prototyping platforms. They come in various lengths and colours, making it easy to organize and identify connections. These wires can be quickly inserted and removed, allowing for efficient circuit assembly and modifications.
- **Types**: Male-to-Male, Male-to-Female, and Female-to-Female connectors.

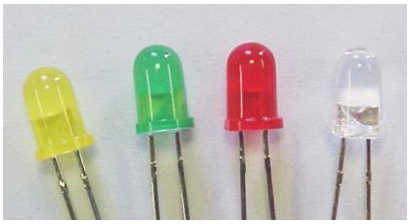
9V DC Battery:

- The 9V battery serves as the primary power source for the circuit. It provides a stable 9V direct current (DC) supply, ensuring the proper operation of the transistors, resistors, and LEDs.
- **Voltage Rating**: 9V
- **Current Rating**: Varies depending on the battery type, typically ranging from 500mAh to 1000mAh.
- **Applications**: Portable power supply for low-power electronic projects.

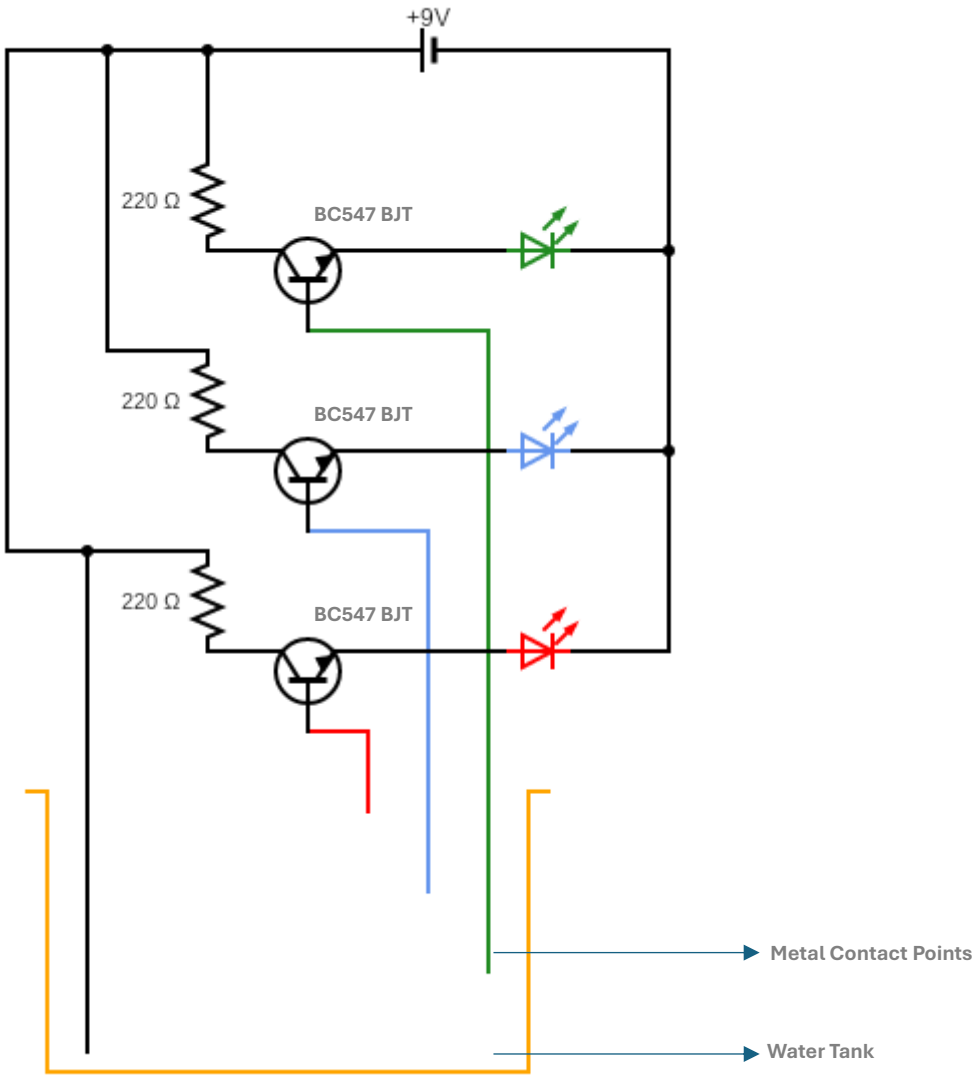
LEDs (Light Emitting Diodes):

- LEDs are semiconductor devices that emit light when an electric current flows through them. In this project, LEDs are used as visual indicators to show the water levels in the tank. Each LED lights up sequentially as the water level rises, providing a clear and intuitive display.
- **Forward Voltage**: Typically, around 2V to 3.3V, depending on the colour of the LED.
- **Current Rating**: Typically, 20mA
- **Applications**: Visual indicators, lighting, and displays in various electronic devices.





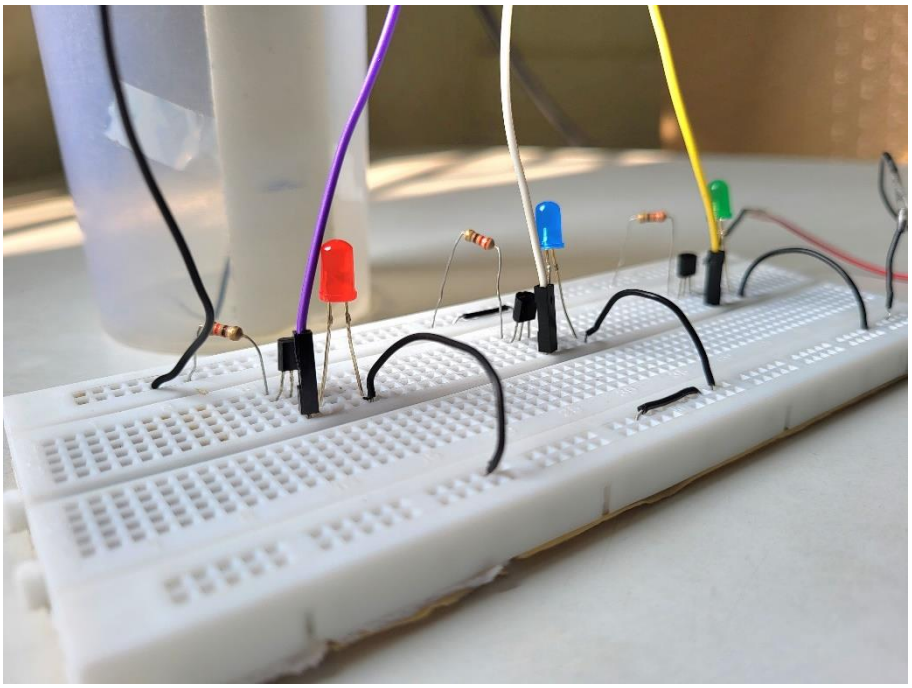
Circuit Diagram



Working Principle

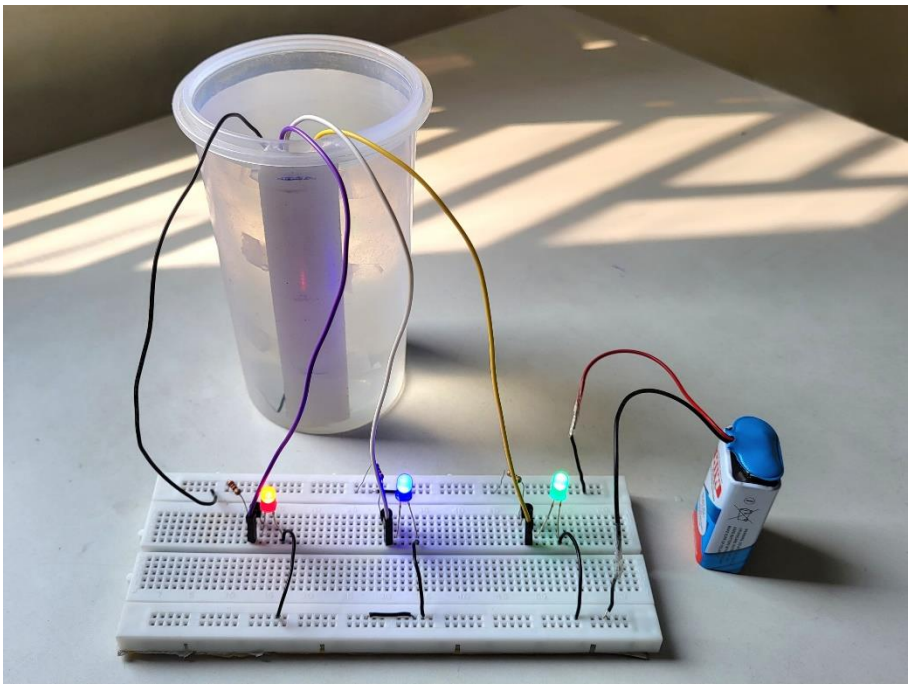
The most significant working principle of this water level indicator project is **using transistors as switches activated by the conductive properties of water**.

- **Transistors as Switches**: The key element in this project is the use of transistors. A transistor allows current to flow from the collector to the emitter when a small current is applied to the base. This effectively turns the transistor on or off, similar to a switch.



- **Water Conductivity**: Water, particularly tap water, conducts electricity due to the presence of minerals and impurities. When the water level rises and touches the base of a transistor, it acts as a bridge that allows current to flow into the base, thereby turning the transistor on.

- **Sequential Activation**: As the water level rises in the tank, it sequentially completes the circuits for each transistor. This sequential activation lights up the LEDs one by one, indicating the rising water level.
- **Visual Feedback**: The LEDs provide a visual indication of the water level, making it easy to monitor how full the tank is.



In essence, the most significant principle here is the **interaction between water's conductive property and the transistor's switching capability**, which provides a simple yet effective way to measure and indicate water levels.

Result

The water level indicator project was successfully completed and operated as expected. Each component functioned correctly, and the LEDs lit up sequentially as the water level rose, providing clear and accurate visual indications of the water levels. The transistors effectively acted as switches, amplifying the small current provided by the conductive properties of water. The entire system demonstrated reliable performance, validating the design and principles behind the project. This successful implementation highlights the project's effectiveness in real-time water level monitoring, achieving all set objectives and providing a practical solution for water management.

Precautions

- Ensure all connections are tight to maintain proper functionality.
- Mount the components at the appropriate places before finalizing; follow the circuit description and components details, leads identification, etc.
- Ensure that all components are mounted at the right place before proceeding.
- Position the board so that gravity tends to keep the components where you want them.
- The board should not vibrate while assembling; otherwise, you may have a dry or cold joint.

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