ENTC
Electronic and Telecommunication Engineering

EN - 1190 ENGINEERING DESIGN PROJECT
Group Power On

Project Report

NUTRITECH POT

Growing made simple

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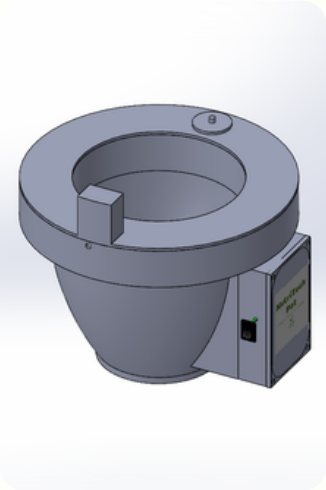
The NutriTech Pot

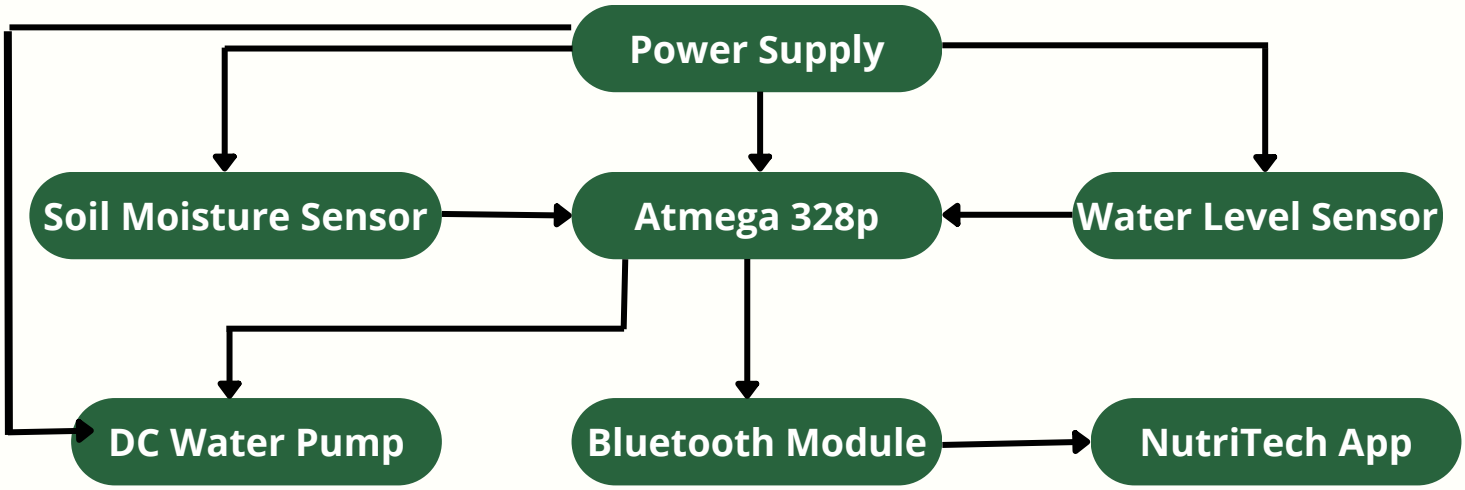


The project aims to address the issues of plant watering by creating a smart plant pot that automatically waters plants when the soil moisture level is low to ensure optimal growing conditions.

The purpose of our product, the NutriTech pot, is to make gardening easier and more convenient for individuals who are interested in sustainable living but may not have access to outdoor gardening spaces or have busy lifestyles.

The pot is equipped with a soil moisture sensor and a water pump that automatically waters the plant when the soil moisture level is low. It also includes a water level detector that measures the water level in the tank and alerts the user when to add water.

Product Architechture



Changes From the Initial State

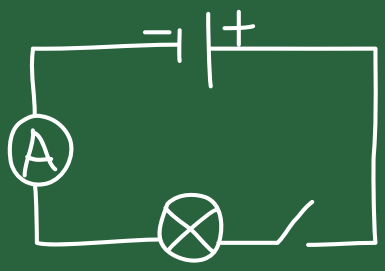
Using Bluetooth Module

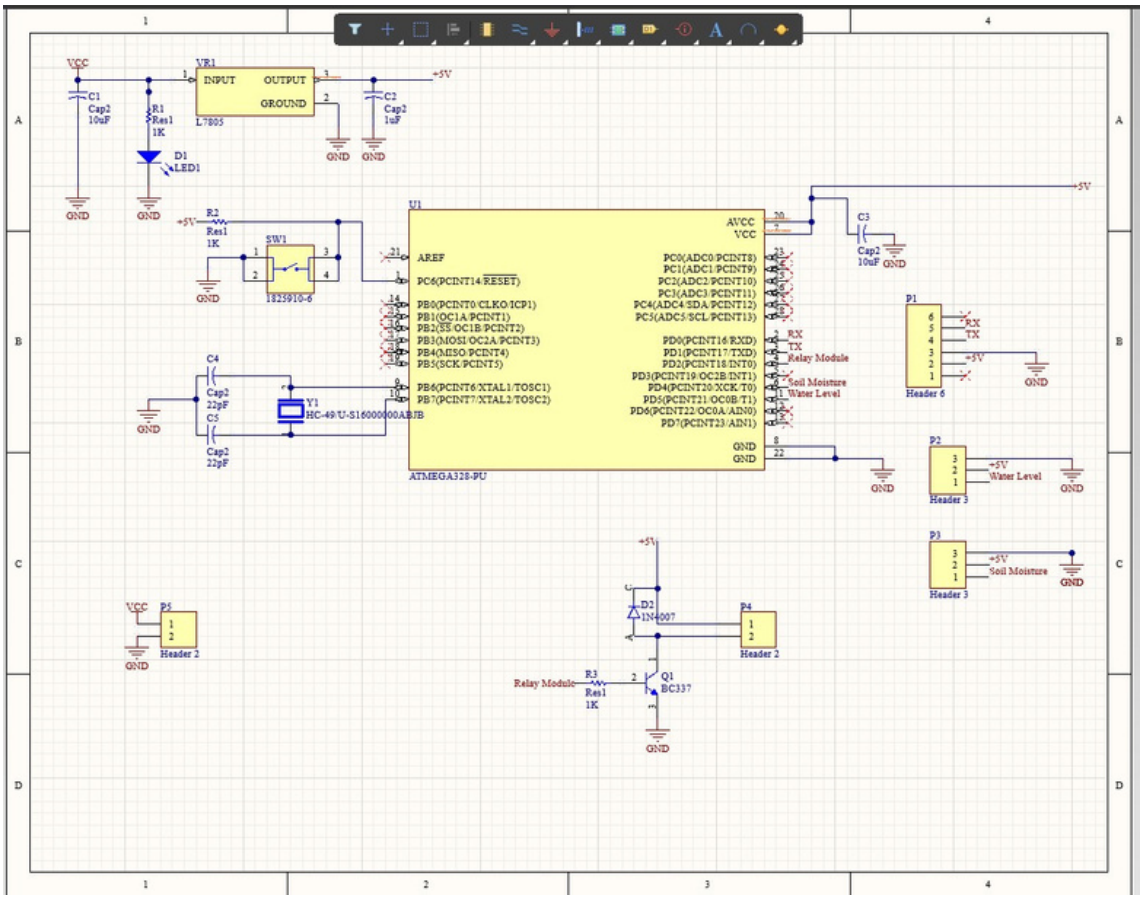
- During our project, we made some adjustments to our initial plan. Initially, we intended to employ a Wi-Fi module (esp 8266) for communication between the chip and the NutriTech pot application.
- However, during the code development phase, we recognized a significant challenge with this approach. To establish a connection between the app and the module, we needed to know the Network SSID and password of the Wi-Fi network which the module was meant to connect. This would have necessitated modifying the code every time the pot was moved to a different Wi-Fi network, making it less practical for users.

- As a result, we sought an alternative solution and concluded that Bluetooth (HC-05) was a more suitable option to establish the connection.
- Although Bluetooth has a shorter range compared to Wi-Fi, it offers higher accuracy and a more user-friendly experience. By using Bluetooth, we can seamlessly monitor the status of the pot and determine whether the tank requires a refill, as long as we are within a range of approximately 10 meters from the pot.

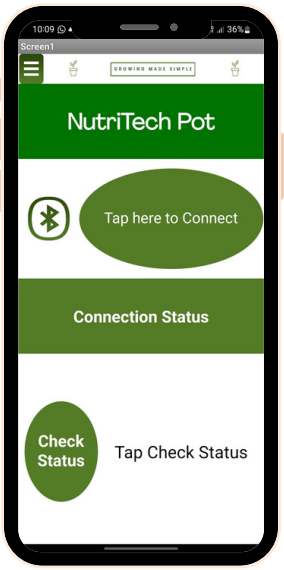
- This decision to switch to Bluetooth not only overcame the limitations of Wi-Fi but also enhanced the overall functionality and user experience of the NutriTech pot application. It allowed us to focus on delivering a more efficient and effective solution for our users, enabling them to conveniently manage their pot's watering needs

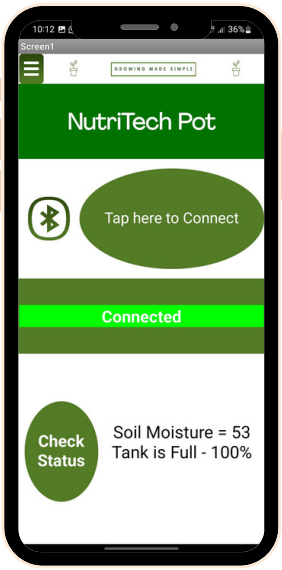
Schematic Diagram

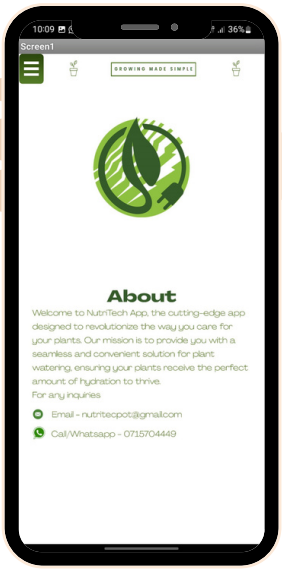




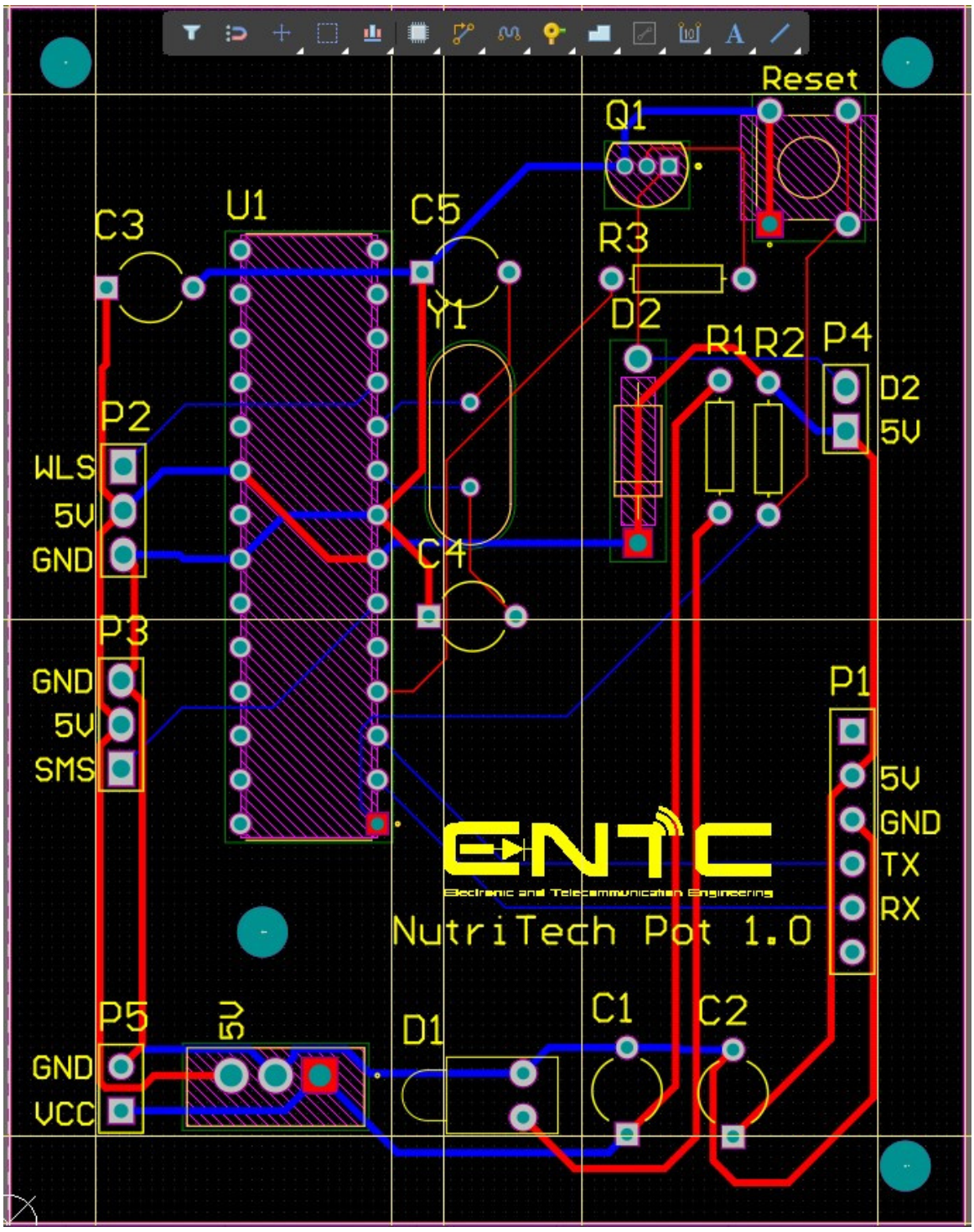
NutriTech Pot App



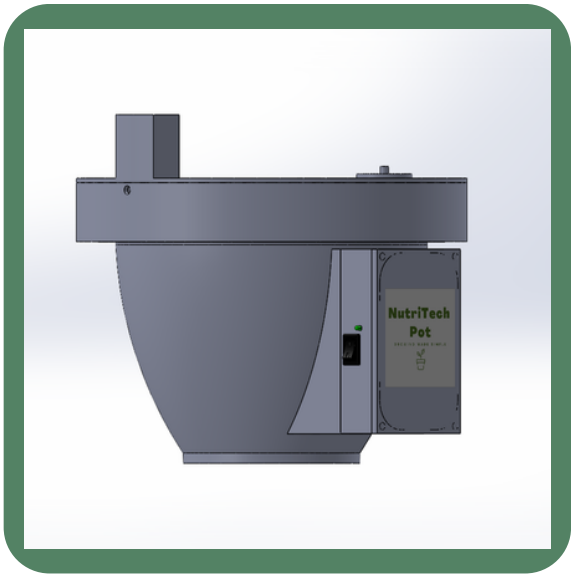


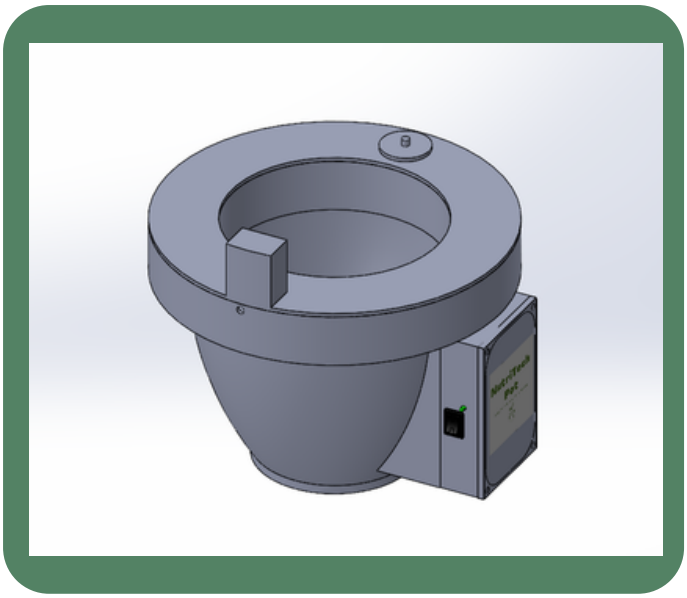


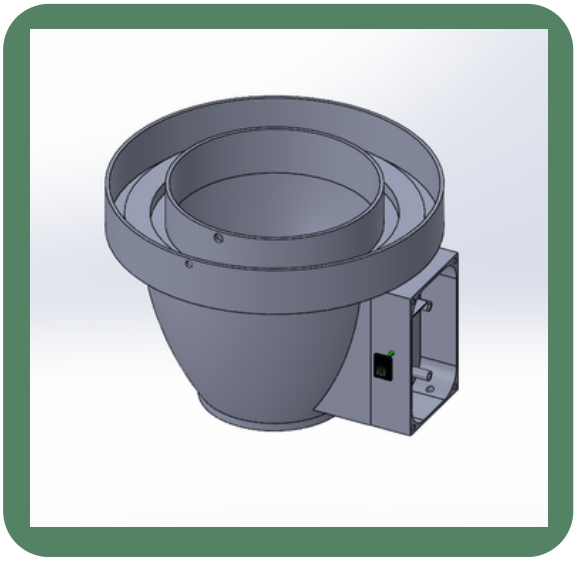
Altium Design

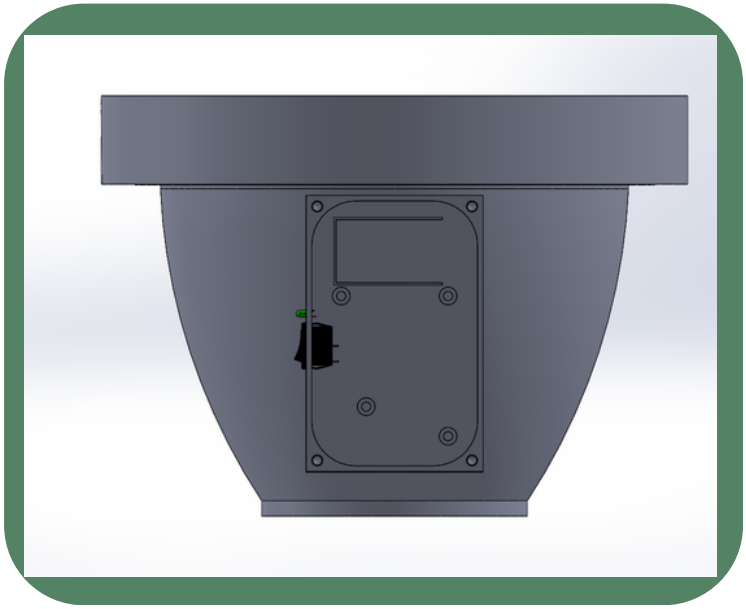


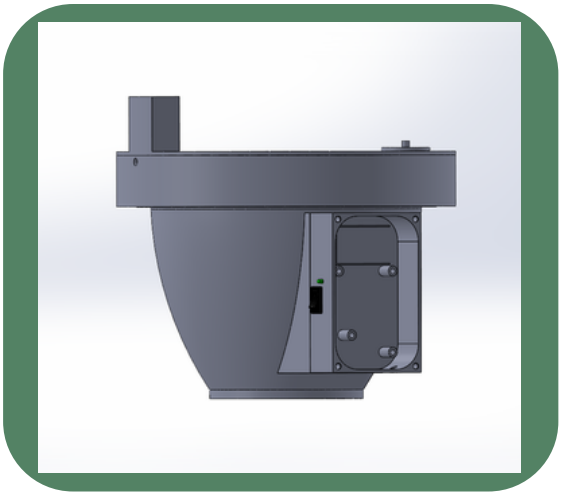
Final Enclosure











Future Improvements

BOTTLENECKS OF THE INITIAL PLAN

In the project report, we initially planned to power the circuit using a 9V battery connected with a voltage regulator (L7805). However, during testing, we encountered a significant issue when the motor started to power up. The power LED began to blink, and the circuit powered down for a few seconds, repeating the same behavior.

REASONS

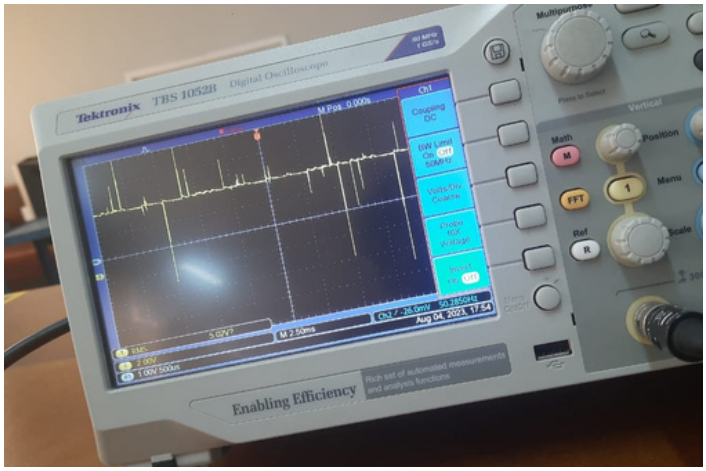
We identified that the problem occurred because the motor drew a high amount of power from the circuit, which the power supply couldn't deliver. As a result, the voltage to the chip decreased, leading to the circuit's shutdown.

SOLUTION

To address this issue, we devised a solution. We decided to implement two separate voltage regulators (L7805) – one for the atmega chip's power supply and another for the DC water pump. Additionally, we replaced the 9V battery with two rechargeable Li-ion batteries (3.7V Li-Fe 18650) as the new power supply for improved performance and stability. This modification allowed us to ensure a consistent power supply to both the chip and the motor, resolving the previous problem.

DEMONSTRATION

For the demonstration, we utilized an LED instead of the DC water pump since it draws less current and effectively showcases the functionality of our product. Unfortunately, we couldn't alter the power supply in this instance due to the constraints of the enclosure and PCB, which were designed for the previously planned circuit.



The photo shows an instance when the motor is connected to the circuit with 9v battery.
We can see a greater amount of noise there

Power Consumption and Battery Life

Using two rechargeable Li-ion batteries (3.7V Li-Fe 18650) as the power supply

Due to the rapid discharge of the 9V battery, we decided to use two 3.7V batteries connected in series.

Battery Life and Power Consumption

Through testing with a DC power supply, we measured the circuit's current draw when the motor was on at 160-170 mA and when the motor was off at 68-75 mA.

Based on these observations, we calculated an approximate power consumption of 1730mAh, which would provide nearly two and a half days of battery life on a single recharge.

This estimation assumes a normal day with the motor activated five times for 15 seconds each time.

Task Allocation

Kodikara K.S.S. - Microcontroller Programming and Mobile App
Kodithuwakku J.N. - Altium and PCB Design
Sehara G.M.M. - Solidworks and Enclosure Design

Product Budget

Component	Qty	Unit Price (LKR)	Price (LKR)
atmega328p Micro Controller	1	1400.00	1400.00
Capacitive Soil Moisture sensor(MD0247)	1	400.00	400.00
HC-05 Bluetooth Module	1	1100	1100.00
DC water pump(RB0031)	1	380.00	380.00
Li-ion batteries (3.7V Li-Fe 18650)	2	600.00	1200.00
Water Level Detector(MD0207)	1	110.00	110.00
16MHz Crystal Oscillator	1	40.00	40.00
Resistors (1 kOhm - 1, 10 kOhm - 1)	2	3.00	6.00
BC 337 npn Transistor	1	5.00	5.00
IN 4007 Diode	1	5.00	5.00
Push Button Switch	1	30.00	30.00
Voltage Regulator	2	50	100.00
Capacitors (10 micro F - 1, 22 pF - 2)	5	5.00	25.00
Connectors	6	20.00	120.00
LED	2	15.00	30.00
Total			**4951.00**

Total production cost - Rs 4800(For multiple Product manufacturing)
PCB Printing and Injection Molding - Rs 1000 (per one unit)
Market Price - Rs 7000
Manufacturing Quantities - 50