



# EXTENDED TIME UPS FOR PC WITH EXTERNAL BATTERY & SOFTWARE SUPPORT



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## Abstract

- Frequent power outages in Pakistan disrupt desktop PC use despite their cost-effectiveness and performance.
- Our project designs a cost-effective UPS for desktop PCs, providing up to 500W power.
- Offers extended backup time of 30 minutes or more.
- Ensures reliable operation during outages and acts as a battery charger when power is available.
- Aims to improve productivity while being cost-effective for widespread use.

## Introduction

- Address the frequent and serious problem of power outages in Pakistan affecting PC usability.
- Offer a cost-effective alternative to expensive commercial UPS systems.
- Provide a UPS solution with a maximum load capacity of 500W and extended backup time of 30 minutes or more.
- Ensure the UPS acts as both an inverter during power outages and a battery charger when electricity is available.
- Enhance data integrity and reduce downtime for PC users during intermittent power supply.
- Improve the overall computing experience by maintaining continuous power supply for desktop PCs.
- Integrate hardware and software for effective energy management and user-friendly control.

## Objective

- Provide an extended power backup solution for PCs to ensure uninterrupted operations during power outages.
- Develop user-friendly software support for enhanced energy management and control.
- Ensure seamless integration and compatibility of UPS components, balancing cost efficiency and high quality.
- Design an intuitive interface and implement robust fault protection mechanisms for reliable and safe operation.

## Flowchart

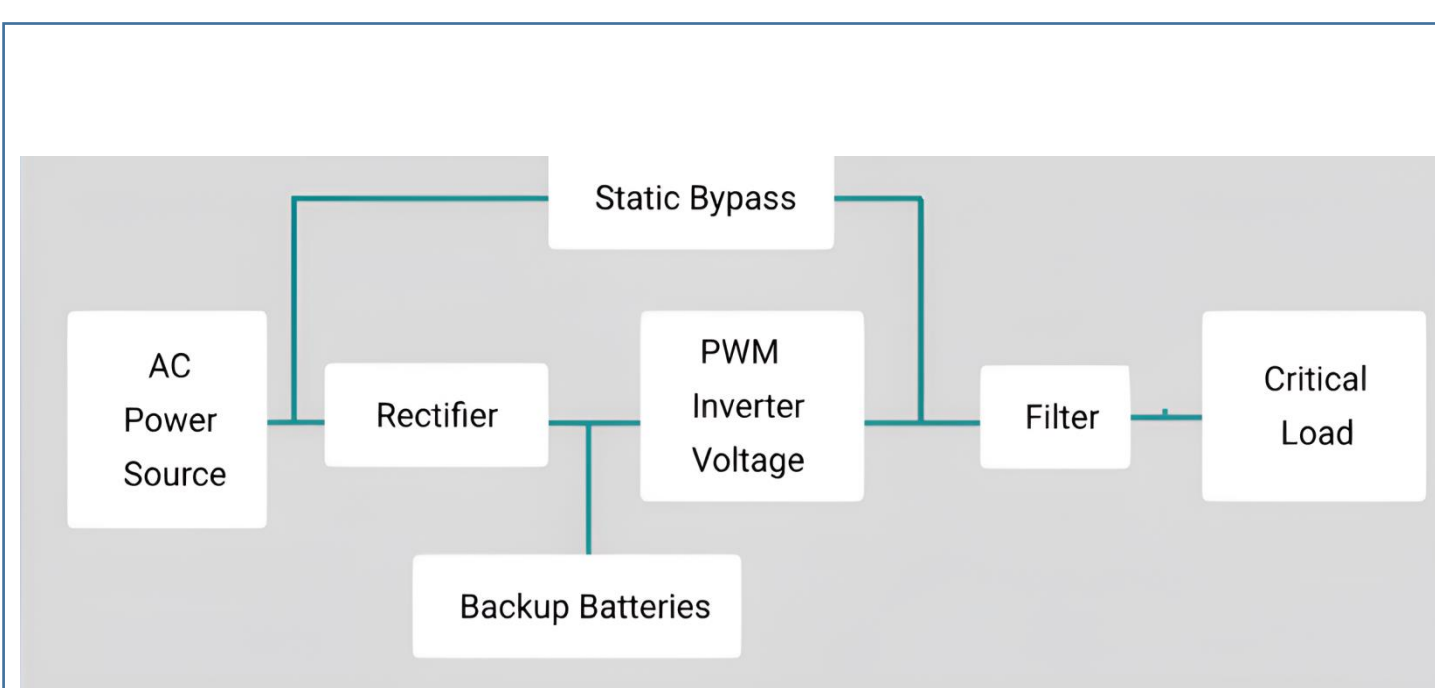


Figure 1: Flowchart Diagram of UPS for PC

## Design and Methodology

- Used Altium software to design the complete inverter circuit, including both low-side and high-side components.
- Routed the designed schematic to create the PCB layout, ensuring optimal component placement and signal integrity.
- Assembled the manufactured PCB and tested each component to ensure functionality
- Utilized STM32 microcontroller for control and ESP32 for IoT capabilities, enabling real-time data transmission to Firebase.
- Implemented IoT features using Firebase Realtime Database, linking it with the ESP32 to send critical UPS parameters (voltage, current, power factor, status) for real-time monitoring..

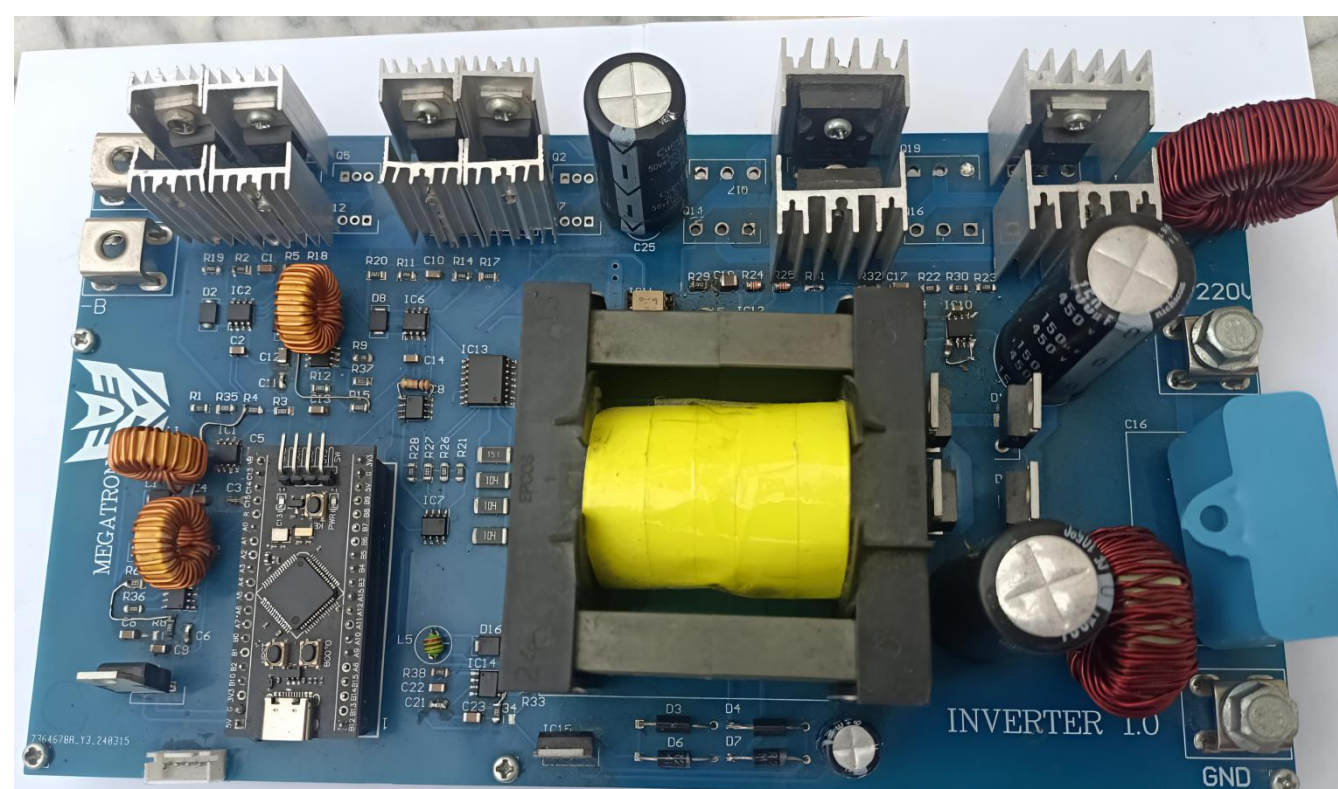


Figure 2: Discharging Path (Inverter)

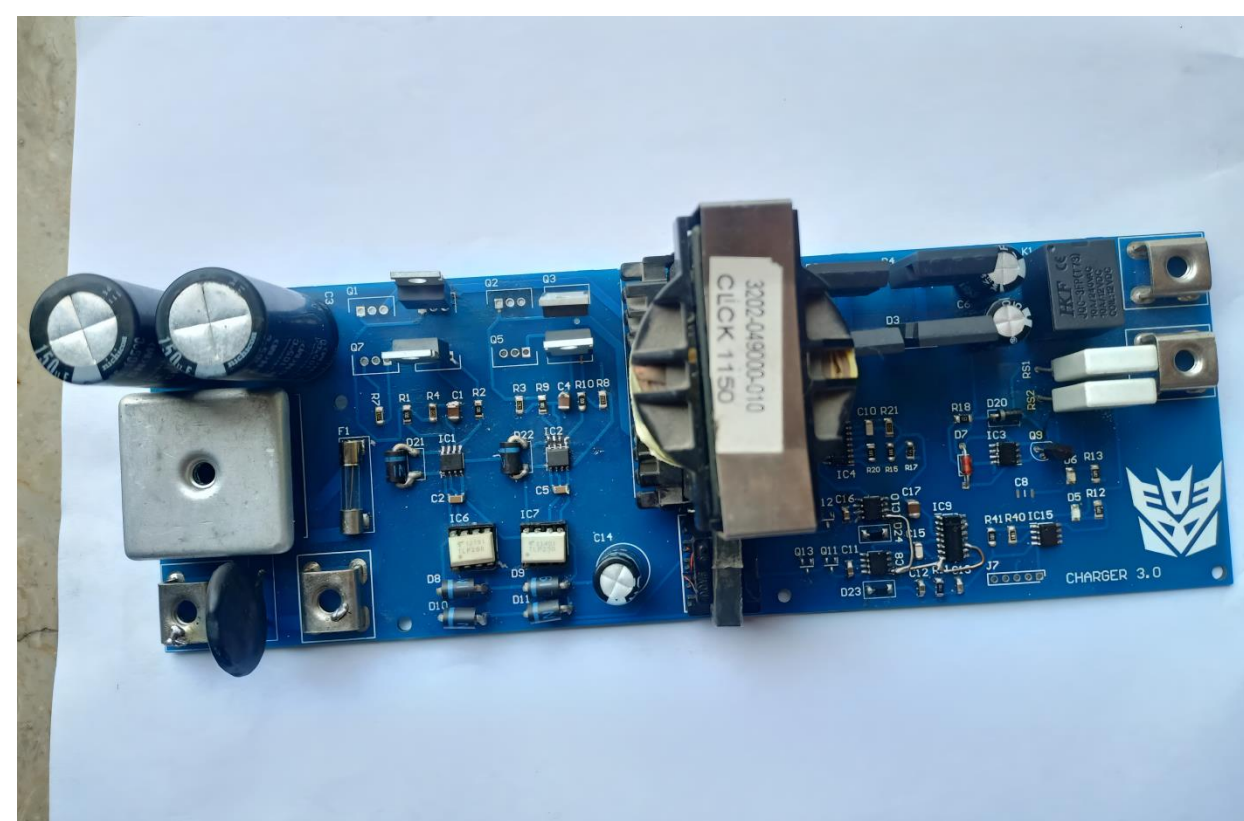


Figure 3: Charging Path (Charger)

## Software Support

- Create a Firebase project and enable Realtime Database.
- Develop firmware for the ESP32 using Arduino IDE to collect and transmit sensor data.
- Design a responsive web UI with HTML, CSS, and JavaScript.
- Integrate Firebase SDK for real-time data updates and visualization using Chart.js.

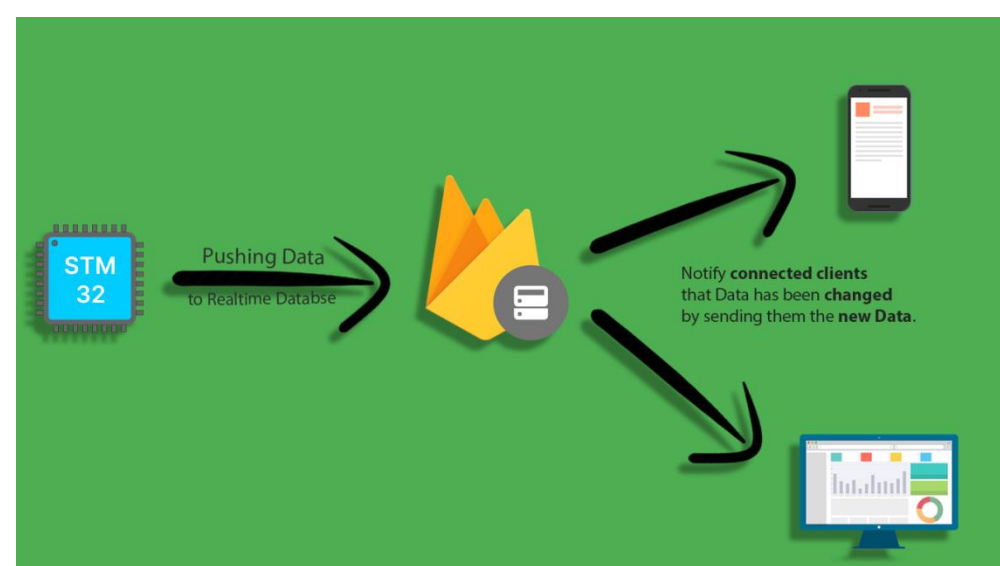


Figure 4: IoT Implementation Working Diagram

## Final Product

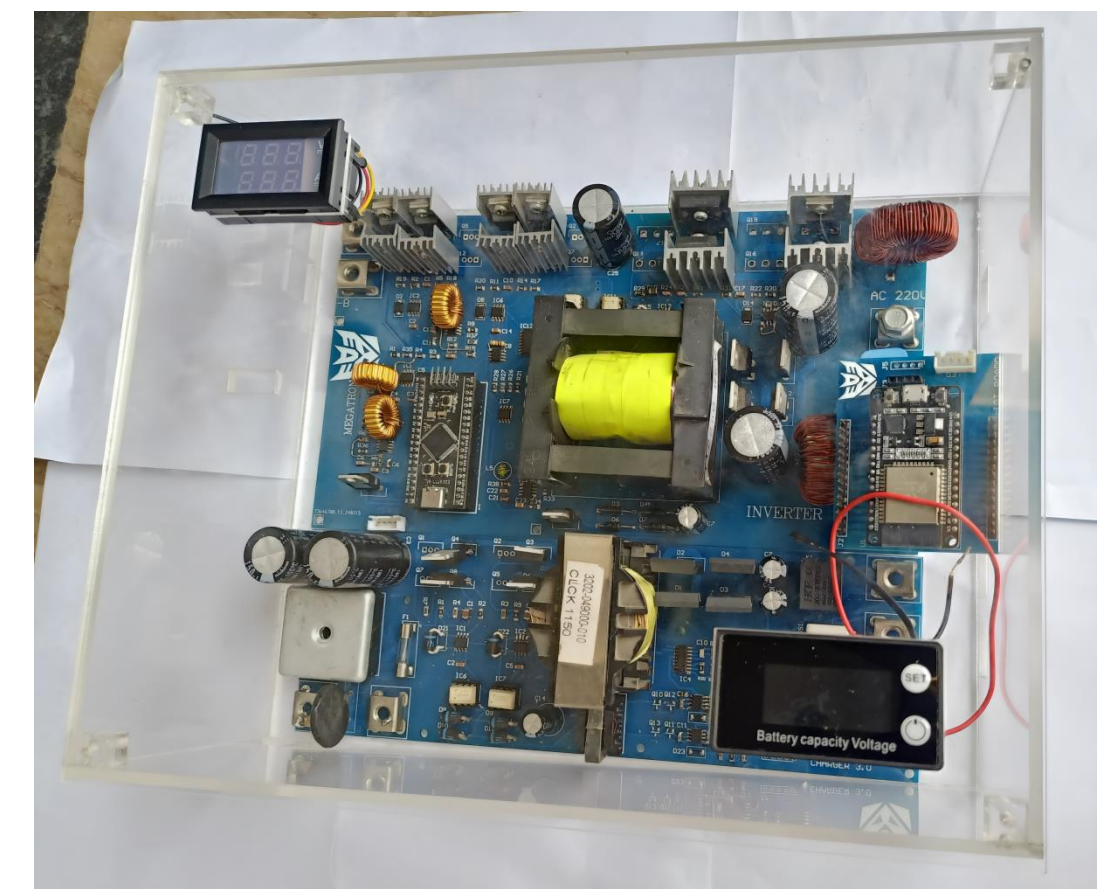


Figure 5: Extended Time UPS for PC

## Results

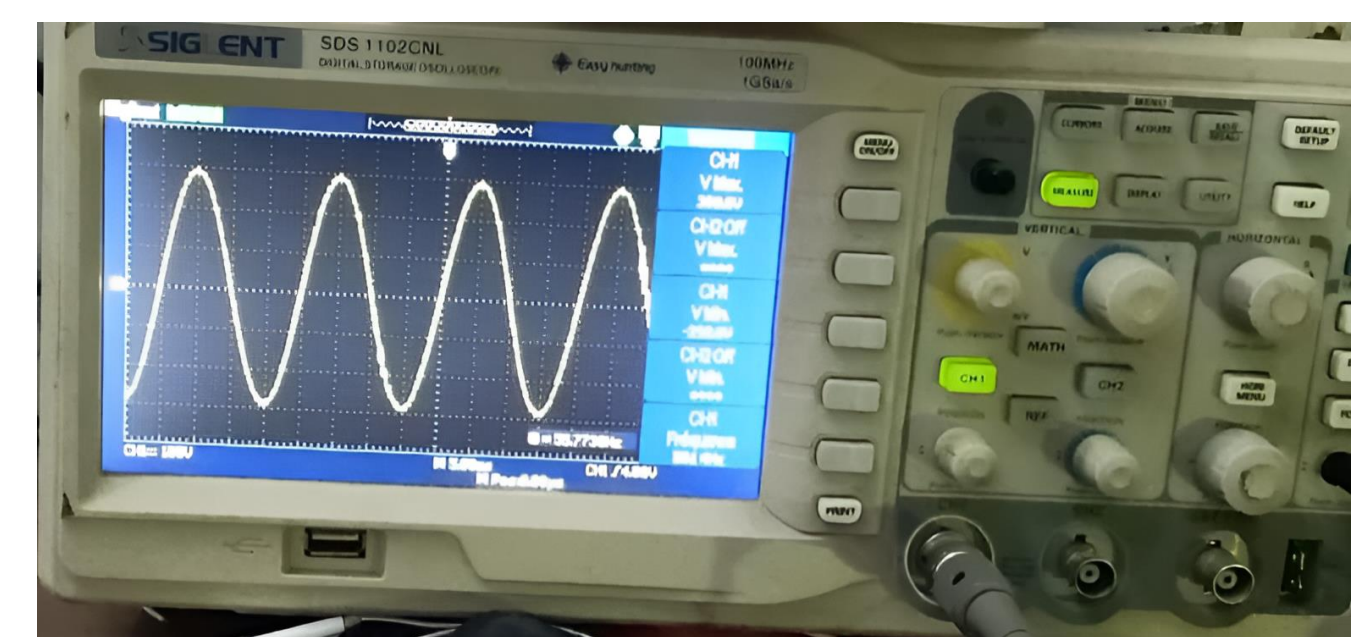


Figure 6: Inverter Output Waveform

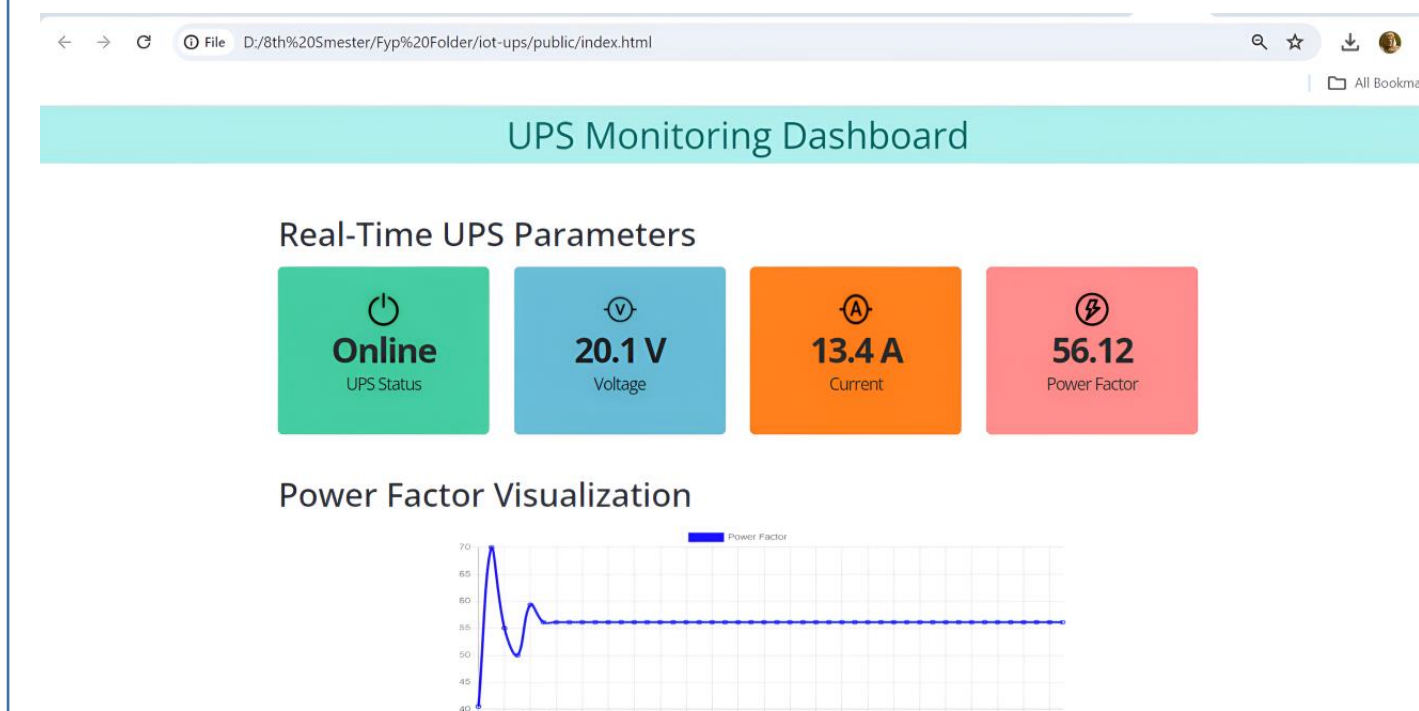


Figure 7: Web Page

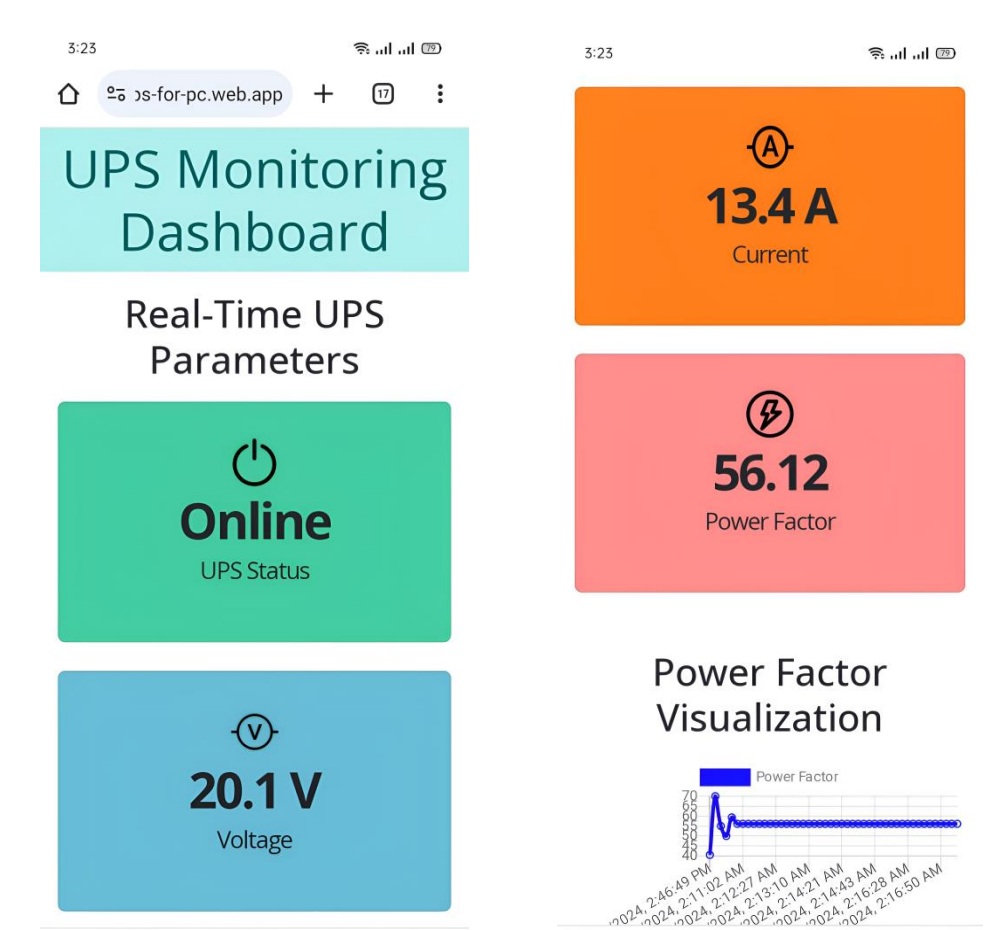


Figure 8: Mobile Page

## Conclusion

- The project met its objectives by developing a reliable and extended time UPS system with integrated software support.
- Real-time data monitoring and alerts ensure continuous power supply and system efficiency.
- The successful implementation highlights the feasibility and practicality of combining traditional hardware with modern IoT solutions.

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