CEO
M. Bilal Javaid

Valid from: 30th September 2025

Valid To: 7th Octber 2025

Feasibility Report

Smart Water Monitoring & Purification Device

Client Name: Olu

About M. Bilal Javaid

Link to Intro

- 8+ years of experience in industrial design and electronics engineering.
- Expertise in PCB design, 3D modeling, and Prototyping.
- Specialized in embedded systems (STM32, ESP32, Raspberry Pi)
- Proficient in CAD, Rendering and DFM
- Builds practical, manufacturable tech solutions by uniting design and engineering.

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Project Scope

This project will develop a Smart Water Monitoring & Purification Device that combines advanced water monitoring, real-time sensing, wireless connectivity, and automated purification technology. The system will continuously monitor water consumption and key quality metrics such as pH, lead, mercury, manganese, and magnesium levels, while providing AI-driven insights for efficiency, safety, and compliance with health standards. The low-power, IoT-enabled design will feature scalable hardware, robust purification systems, and seamless cloud and mobile integration for remote monitoring and control.The device will analyze water quality, detect contaminants, and activate purification cycles to correct pH and remove harmful substances, ensuring safe drinking water at all times.

Key Requirement:

- Core Monitoring Capabilities
    - Real-time pH level tracking and automatic correction
    - Lead contamination detection and filtration
    - Mercury presence monitoring and removal
    - Manganese concentration measurement and treatment
    - Magnesium/hardness analysis and softening
- Integrated water monitoring system for continuous tracking of consumption, pH, and contaminant levels with automated alerts and corrective actions
- End-to-end hardware design, prototyping, and testing of IoT-enabled device
- Low-power embedded firmware development for real-time data acquisition and monitoring
- PCB design with schematic capture, layout, and BOM optimization
- Enclosure design ensuring manufacturability, durability, and compliance with safety/water standards
- Mobile app support for monitoring, maintenance alerts, and AI-driven recommendations

At project completion, a fully functional, reliable, and standards-compliant smart water monitoring and purification system will be delivered ready for large-scale deployment and seamless integration with smart home and industrial water management platforms.

Chapter : 01

Research and Development

1.1 Approach

All hardware validation and firmware development for the water quality monitoring system will be executed in-house. The process begins with the characterization of the multi-sensor array and actuator control subsystem, utilizing the ESP32 microcontroller to establish a reliable foundation for continuous environmental monitoring. Firmware is architected for deterministic, event-driven performance, employing non-blocking state management and real-time sensor processing to ensure system stability and responsive treatment activation. Validation includes rigorous sensor calibration against laboratory standards, reliability testing under continuous duty cycles, and communication precise testing across varying network conditions. The deliverable comprises a production-ready firmware binary and complete hardware documentation, optimized for operational reliability and precise water quality intervention.

Finalize Hardware Specifications

- ESP32-S3 microcontroller with dual WiFi/GSM internet connectivity
- High-precision pH sensor for alkaline/acidity measurement
- Comprehensive sensor array for pH, Lead, Manganese, Magnesium, and Mercury detection
- Capacitive water level sensors with wired or wireless comunication.
- Multi-channel relay system for pump and valve control
- Dual power supply (mains + battery backup)

Prototype Validation

- Assemble a prototype to verify full electrical integration and logical operation of all subsystems, including the GSM module
- Comprehensive laboratory testing and validation of pH monitoring accuracy, Lead detection sensitivity, Mercury measurement precision, Manganese quantification reliability, and Magnesium analysis performance, along with purification system

efficacy, wireless connectivity stability, and power management efficiency to verify full system compliance with design specifications before pilot deployment.

- Verify reliable switching of valves/pumps via relays and confirm GSM functionality.
- Comprehensive testing of capacitive sensor accuracy across various water qualities, temperature stability, and multi-tier calibration for both wired or wireless configurations to ensure seamless integration with the main control system.

Optimize Firmware for Real-Time Performance

- Implement a state machine architecture for non-blocking management of tasks (sensing, treatment, communication).
- Develop timer-based routines for sensor polling, GSM heartbeat checks, and system operation.
- Integrate software filtering for sensor data stability and design power sequences to prevent brownouts during GSM transmission and actuator operation.

Core Firmware Feature Development

- Individual calibration functions for pH, Lead, Manganese, Magnesium, and Mercury sensors
- Automated treatment decision algorithms based on water quality parameters
- Multi-communication protocol support
- Real-time data synchronization between water quality and level monitoring systems
- Security protocols for wireless communication and data transmission

Develop Mobile Application for Monitoring and Control

- Comprehensive dashboard displaying real-time, pre-treatment, and post-treatment metrics
- Visual indicators for all five parameters: pH, Lead, Manganese, Magnesium, and Mercury

- Historical data tracking and trend analysis for all water quality parameters
- Remote system control and calibration initiation capabilities
- Multi-level alert system for water quality breaches and system maintenance

Working

This project is an integrated hardware and firmware system designed to autonomously monitor and manage water quality. It operates by using a suite of sensors to continuously measure key parameters, including pH which serve as indicators for acidity and the presence of elements like manganese, magnesium, lead and mercury. The onboard ESP32 microcontroller processes this data in real-time using optimized firmware that executes a deterministic state machine, enabling the system to make instant decisions. Based on predefined thresholds, the system automatically activates specific treatment processes such as neutralizing acidity or filtering particulates by controlling pumps and valves via relay modules. All operational data and critical alerts are transmitted remotely via GSM, providing professional-grade, continuous water management without requiring human intervention.

Suggested Components and Justification

Component Category	Specific Part / Model	Justification
Core Controller	ESP32 DevKit C	Dual-core processor handles sensor data & communication simultaneously. Integrated Wi-Fi/Bluetooth enables local diagnostics. Ample GPIO pins control peripherals. Industry-standard for IoT.
Sensors	Gravity: Analog pH Sensor Kit (DFRobot SEN0161)	Professional-grade refillable electrode & signal conditioner. Provides stable analog output for accurate pH measurement—the master variable in water chemistry.
	Gravity: Analog Sensor (DFRobot SEN0189)	Measures cloudiness as a proxy for Manganese. Reagent oxidizes dissolved Mn into solid particles, correlating to concentration.
Actuation & Control	4-Channel 5V Relay Module	Isolates low-voltage ESP32 from high-power 12V components (solenoids, pumps). Prevents damage from voltage spikes/back-EMF.
	12V DC Solenoid Valves (Normally Closed)	Automated water routing to treatment paths (e.g., neutralization, filtration). "Normally closed" ensures fail-safe operation during power loss.
	12V DC Diaphragm Water Pump	Moves water through sampling/treatment stages. Self-priming and dry-run capable for robustness.
	5V Peristaltic Dosing Pump	Precisely doses reagent for manganese testing. Reagent contacts only tubing, preventing contamination.
Connectivity	SIM800L GSM/GPRS Module	Enables data transmission where Wi-Fi is unavailable. Low-cost solution for remote monitoring.
	GSM Antenna (IPX connector)	Ensures stable network connection. Weak signals cause high current draw and communication failures.
Power Management	12V 3A DC Power Supply	Supplies sufficient current for ESP32, sensors, and high-inrush actuators (solenoids, pump).
	DC-DC Buck Converter (LM2596)	Efficiently steps 12V down to 5V for ESP32, sensors, and peristaltic pump. Superior to linear regulators.
	Capacitors (1000µF 16V, 100nF ceramic)	Bulk capacitor handles solenoid inrush current; ceramics filter high-frequency noise on power rails.
Consumables & Misc.	Manganese Test Reagent Kit (e.g., Hach TNT843)	Chemical reagent oxidizes dissolved Mn^{2+} to solid MnO_2, enabling -based measurement.
	pH Calibration Buffer Solutions (4.0, 7.0, 10.0)	Essential for calibrating pH sensor accuracy. Multi-point calibration ensures reliability.
	Tubing, Fittings, Enclosure, Wiring	Protects electronics from water exposure. Enclosure must be waterproof and spacious for safety.

Milestones and Deliverables

Milestones

- Finalize Hardware specification
- Build and Validate breadboard prototype
- Optimize Firmware for real time performance
- Develop core firmware features
- Develop Mobile application for monitoring and control
- Refinement and Launch Preparation

Deliverables

- Approved Hardware Design Complete specifications for 5-parameter water monitoring system with dual connectivity
- Functional Prototype Working system integrating all sensors, connectivity, and basic mobile app
- Validation Ready System firmware with full calibration and complete mobile application
- Testing Documentation Laboratory validation reports for all parameters and system performance

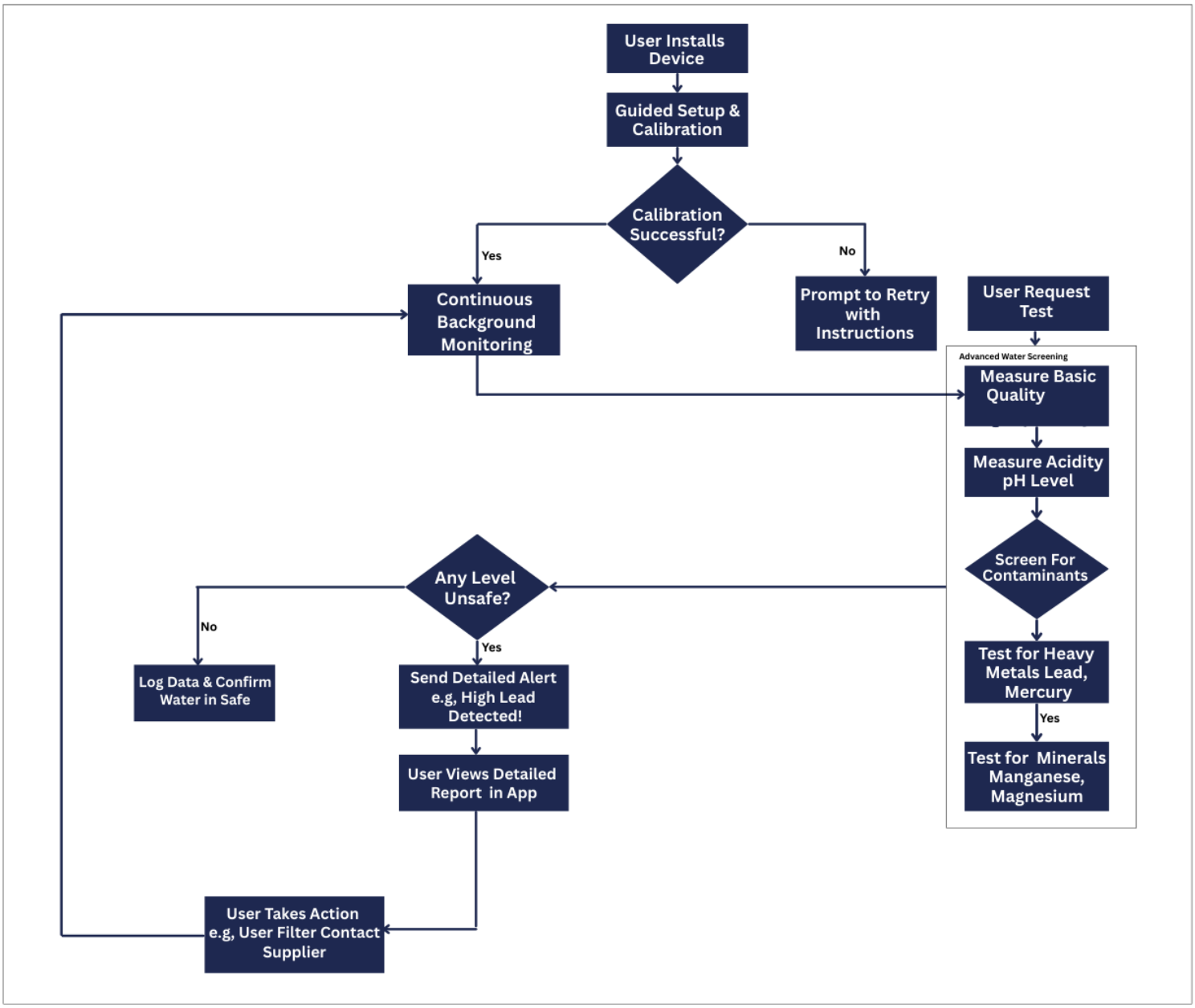
Timeline

- Finalize Hardware Specifications – 40 Hours
- Build and Validate Breadboard Prototype – 60 Hours
- Optimize Firmware for Real-Time Performance – 60 Hours
- Develop Core Firmware Features – 80 Hours
- Testing & Validation – 40 Hours
- Documentation – 10 Hours
- Mobile Application Development (Parallel work) – 160 Hours

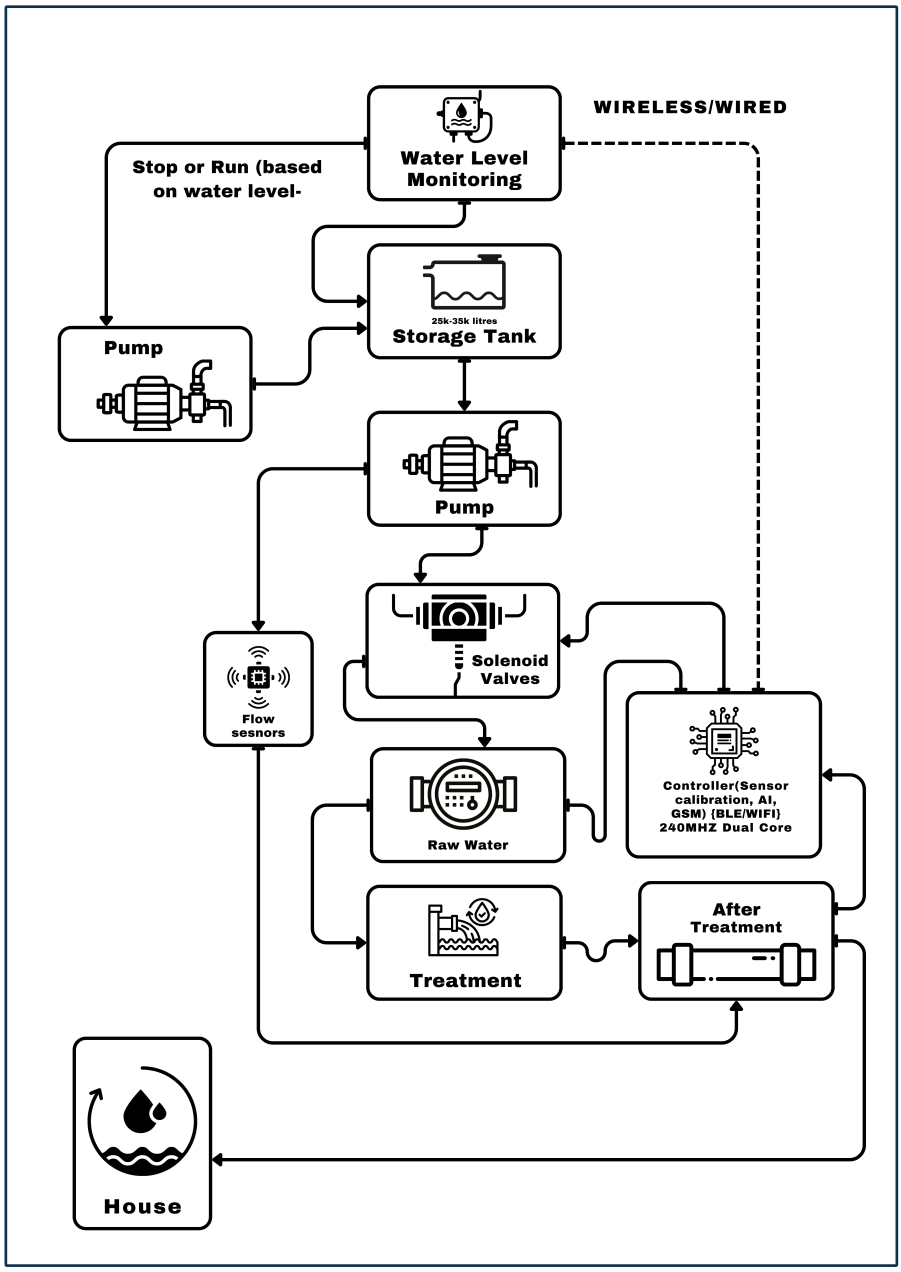
Note

- Total R&D Time: 320 Hours

Flowchart



Block Diagram



Total timeline for R&D: 320 Hours

Signature of R&D HOD:

Chapter : 02

PCB Design

2.1 Approach

After finalizing component selection, we will initiate the schematic design phase for developing waterproof and reliable PCBs for the smart water monitoring and purification system. Our approach will emphasize sensor integration, wireless communication, low-power operation, and robust environmental protection against water, humidity, and corrosion. The resulting design will prioritize safety, manufacturability, and full compliance with international standards.

PCB Design Considerations

Environmental Protection

- Apply conformal coating to protect against condensation, humidity, and splashes.
- Use waterproof connectors (IP67 rated) for sensor and power interfaces.
- Maintain creepage and clearance distances around high-voltage/power sections.
- Position high-risk components (power, RF) away from water-contact zones.

Power & Safety

- Efficient power regulation with surge and reverse-polarity protection.
- Isolation between sensor circuits and high-voltage purification elements.
- Overcurrent, overvoltage, and thermal cutoffs.

PCB Layout

- Multi-layer PCB with dedicated ground planes for analog/digital separation.
- RF layout optimized for antenna performance.
- Wide copper pours for power traces to handle pump/motor current
- Keep sensors on modular daughterboards if needed, for replacement/serviceability.

Compliance & Certification Prep

- Design aligned with CE, FCC (EMI/EMC), RoHS, UL safety standards.
- EMI shielding for wireless modules.

Reliability

- Extended temperature rating components.
- Gold-plated contacts to avoid corrosion.
- Automotive/industrial-grade connectors where possible.

PCB Design Approach

Step 1 Schematic Capture

- Power management, sensor interfaces, wireless modules, purification driver.
- Component selection based on water-environment reliability.

Step 2 PCB Layout

- 4-layer board: Power, ground, signals, RF.
- Sensor input isolated and filtered for accuracy.
- Protective coatings and waterproof connectors.

Step 3 Certification Prep

- Pre-compliance EMI/EMC testing.
- Conformal coating + IP-rated enclosures.

Milestones and Deliverables

Milestones

- Power, sensor, wireless, and driver design
- Water-reliable component selection
- Schematic and PCB layout (Gerber, drill, fab files)
- BOM and exploded views for waterproof housing
- Conformal coating and sealing recommendations

Deliverables

- Complete schematic diagrams.
- PCB layout (Gerber, drill, fab files).
- BOM with component specs.
- Exploded views showing PCB placement in waterproof housing.
- Conformal coating and sealing recommendations.
- Assembly drawings with connector details.
- Documentation Support for certification

Timeline

- Power, Sensor, Wireless, and Driver Design – 40 Hours
- Water-Reliable Component Selection – 20 Hours
- Schematic and PCB Layout (Gerber, Drill, Fab Files) – 60 Hours
- BOM and Exploded Views for Waterproof Housing – 20 Hours
- Conformal Coating and Sealing Recommendations – 20 Hours

Note

- Total PCB Design Time: 160 Hours

PCB fabrication will be carried out through JLCPCB, ensuring high-quality manufacturing and adherence to design specifications. The estimated lead time for fabrication and delivery is approximately two weeks.

Client Queries and Our Response

Does your total cost include component acquisition for BOM, enclosure design, and manufacturing?

Yes the total cost include component acquisition for BOM, enclosure design and manufacturing.

Is approximate 2 weeks fabrication and delivery included in total timeline for PCB team?

Yes it is included in the 8 weeks but there's a chance that delivery might get delayed because of various reasons. So in that case 8 weeks should not be enough, but for now, it's included if there's no issues in delivery.

Total timeline for PCB Team: 160 Hours

Chapter : 03

Mechanical Design

Approach

We will design the enclosure and cartridges as a compact, modular stacked- cartridge system optimized for portability, serviceability, and low pressure-drop. The outer shell will be a two-piece body (upper cap + lower cup) made from food-grade polymer (PP or HDPE for prototyping; consider glass-filled nylon or 304 stainless for higher durability). The cap and cup join with an O-ring seal in an axial groove (silicone or EPDM, groove tolerance ±0.15–0.25 mm) and a quick-twist bayonet or short-thread (3–6 turns) to allow tool-free cartridge changes. Internally, a molded flow-channel manifold will direct water sequentially through stacked cartridges; flow distributors (radial ports or a small perforated plate) ensure even flow across each media bed and prevent channeling. Include a small bleed/air-vent valve at the top of the stack and a pressure-relief feature (snap-ring backed by a silicone diaphragm) to protect seals if blocked.

Mechanical hardware design features:

Cartridge design:

Cartridges will be standardized cylindrical inserts with molded end caps that locate into matching receptors in the manifold. Each cartridge will have a female/male alignment boss for positive seating and a silicone lip seal for leak-proof changeouts. Use snap-fit or bayonet retention so cartridges cantilever out for quick removal.

Internal cartridge construction:

Internally, the cartridges will be designed in the following manner:

Outer perforated support shell → pre-filter nonwoven sock → packed media (carbon block, ion-exchange beads, calcite pellets) in segmented chambers separated by micro-porous spacers → final porous diffuser to restrict media washout.

Manufacturing and important design aspects:

For production, design cartridges for injection molding with draft angles ≥1.5°, wall thickness 1.5–3 mm, and ribs for stiffness; prototype using CNC or SLA/HP 3D prints. Add user ergonomics: textured grip areas, clear flow indicator window or arrow, molded labels for cartridge type and replacement date, and a lightweight lanyard eyelet. Target total unit weight under 1 kg (for a 1–2 L device) and an IPX4 splash rating; provide optional O-ring lubricant,

tamper clips, and a tamper-evident band for hygiene. Final step: tolerance stack analysis on sealing surfaces, burst and leak testing at 1.5× expected operating pressure, and usability tests for cartridge replacement under field conditions.

Recommended Filter Media & Stages

Stage	Purpose	Filter/Media
Pre-filter	Remove suspended solids to protect next stages	Fine mesh screen + nonwoven polypropylene (5–20 µm)
Activated Carbon(Block or Granular)	Reduce organic contaminants, chlorine, improve taste and odor	High-quality coconut shell carbon block
Ion Exchange Resin (cartridge system)	Remove heavy metals (Lead, Mercury, Manganese and Magnesium)	Cation exchange resin (e.g., sulfonated polystyrene beads)
pH Adjustment Media	Stabilize or raise pH if acidic (or use neutralizing cartridge)	Cation exchange resin (e.g., sulfonated polystyrene beads)
Micro/Ultra Filtration	Final polishing, bacteria removal	Hollow-fiber UF membrane (0.01–0.1 µm)

Mechanical Assembly Considerations:

- Cartridge layout: Stacked vertical cartridges (gravity-fed) or inline horizontal cartridges (pump-fed).
- Replaceability: Quick-twist or push-fit filter modules.
- Flow control: Check valves or small manual pumps to maintain pressure.
- Monitoring: Optional slots for inline pH.

Standard Threads:

Cartridge-to-housing threaded connection (user-replaceable cartridge):

ISO metric screw — M30 × 1.5 with an axial O-ring face seal.

Plumbing inlet / outlet (external water connections):

Use parallel pipe thread (G) per ISO 228-1 — G¼ for low-flow handhelds or G½ for higher flow / faster fill.

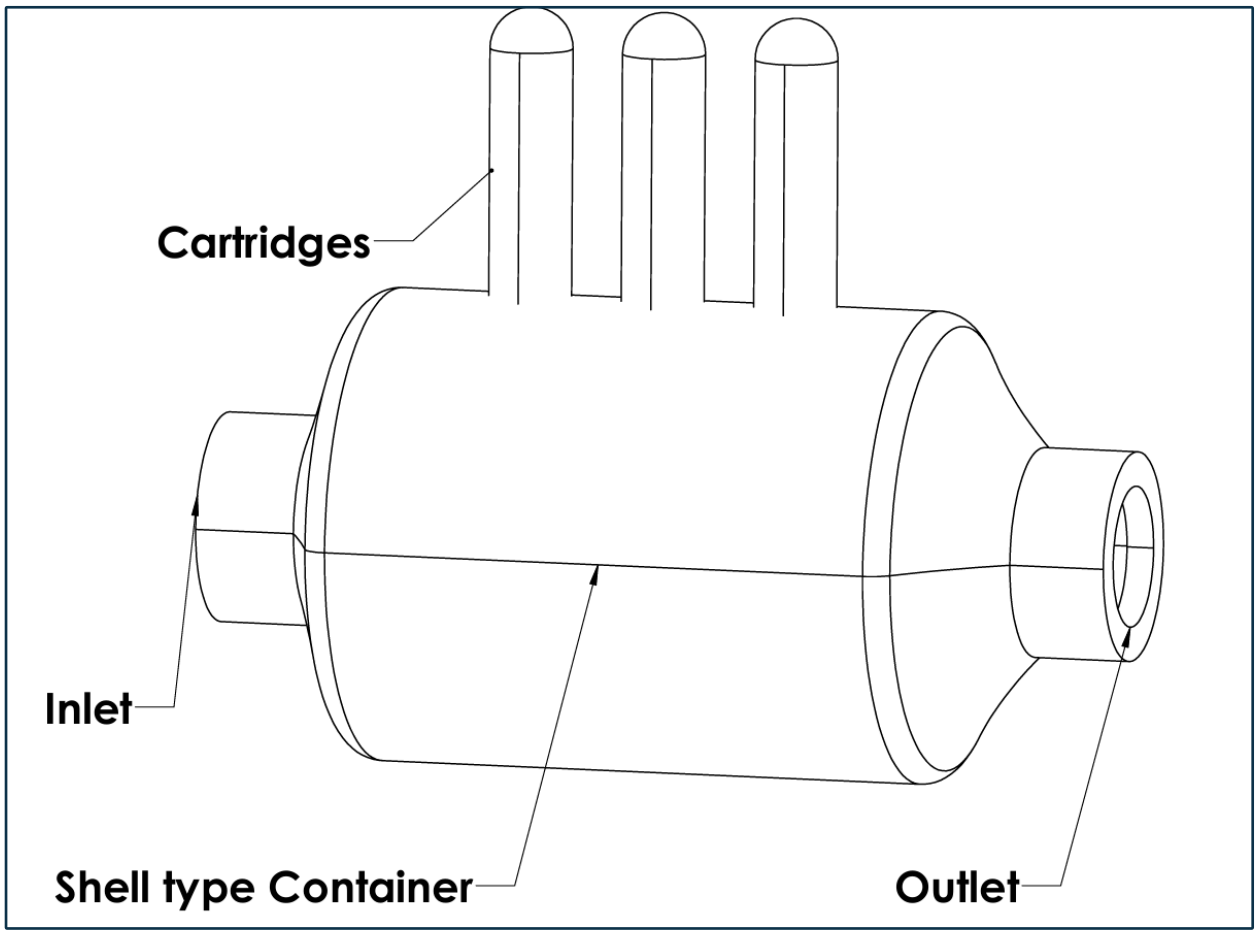
Prototyping & Testing:

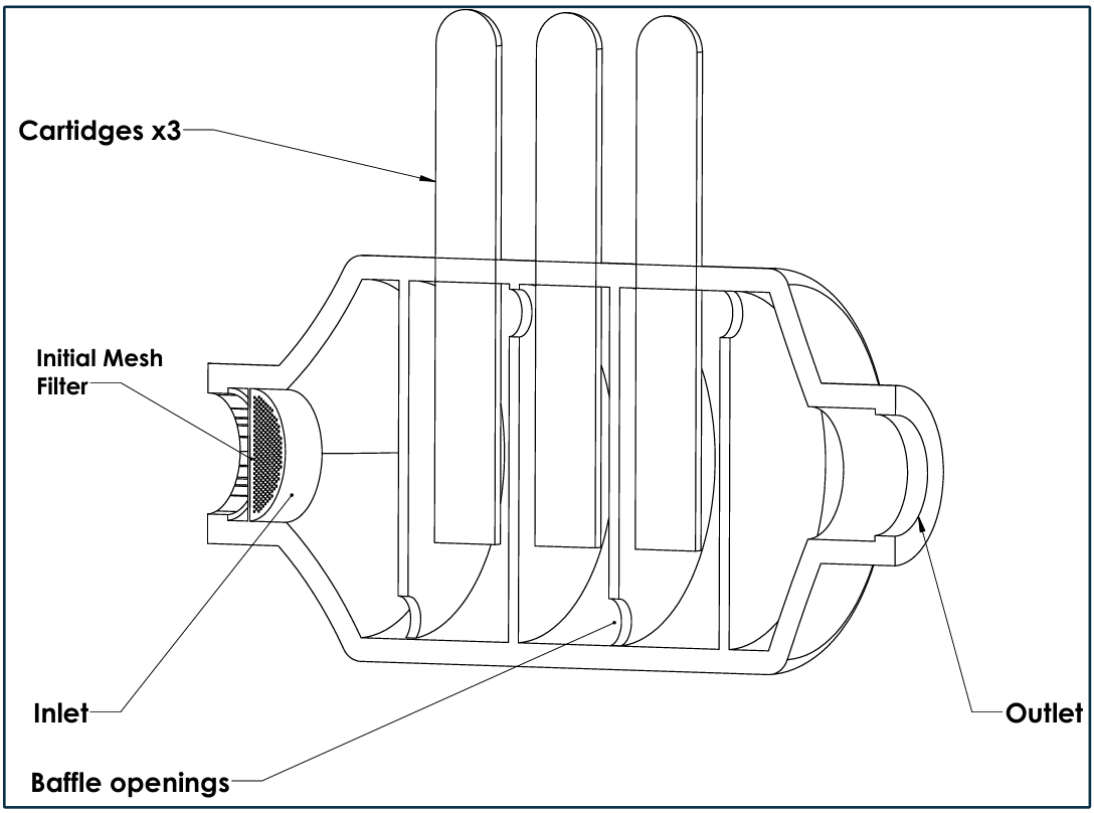
3D print initial models for form and fit checks and proper assembly, fitting of electronic components and integrity checks. Ensuring proper integration of electronics, its connectors and enclosure.

Conceptual Model

A kind of portable filter which has removable cartridges, and internal baffles for proper circulation of the water, the system is portable and can be placed on any water pipeline

Conceptual Model





It can be seen that an initial filtration mesh will be used for removing solids and other macro particles, while the water treatment for pH, Lead, Mercury, Manganese and Magnesium will be done by use of risen cartridges.

The baffles are used for proper circulation of water through the risen cartridges to ensure proper treatment.

Milestones and Deliverable

Milestones

- Conceptual sketches and layout design
- Initial CAD modeling for enclosure and manifold
- DFMA refinement including mounts, locks, and sealing features
- Prototype builds using in-house 3D printing and assembly
- Mechanical testing for sealing, stress, and durability

- Implementation of filter replacement notification system in the app.
- Integration of water quality monitoring sensors (pH, Lead, Manganese, Magnesium, Mercury) into the mechanical assembly.

Deliverables

- Complete conceptual sketches and layout drawings
- Detailed CAD models with sealing, locking, and mounting features
- DFMA-optimized design ready for manufacturing
- 3D-printed prototype assemblies for validation
- Test reports for sealing, stress, and durability performance
- App feature enabling real-time user notifications for filter replaceability.
- Prototype and app interface showing monitoring and reporting of pH, Lead, Manganese, Magnesium, and Mercury levels.

Timeline

- Conceptual Sketches & Layout – 12 Hours
- Initial CAD (Enclosure + Manifold) – 40 Hours
- DFMA Refinement (Mounts, Locks, Sealing) – 32 Hours
- Prototype Builds (3D Prints, Assembly) – 32 Hours
- Mechanical Testing (Sealing, Stress, Durability) – 32 Hours

Note

- Total Mechanical design Time: 148 Hours

3D printing and assembly of prototypes will take around four days, including printing, post-processing, and fitting of all key components. This period will allow us to validate assembly alignment, sealing performance, and structural strength. Testing will begin

immediately after assembly to ensure the design meets all functional and durability requirements.

Client Queries and Our Response

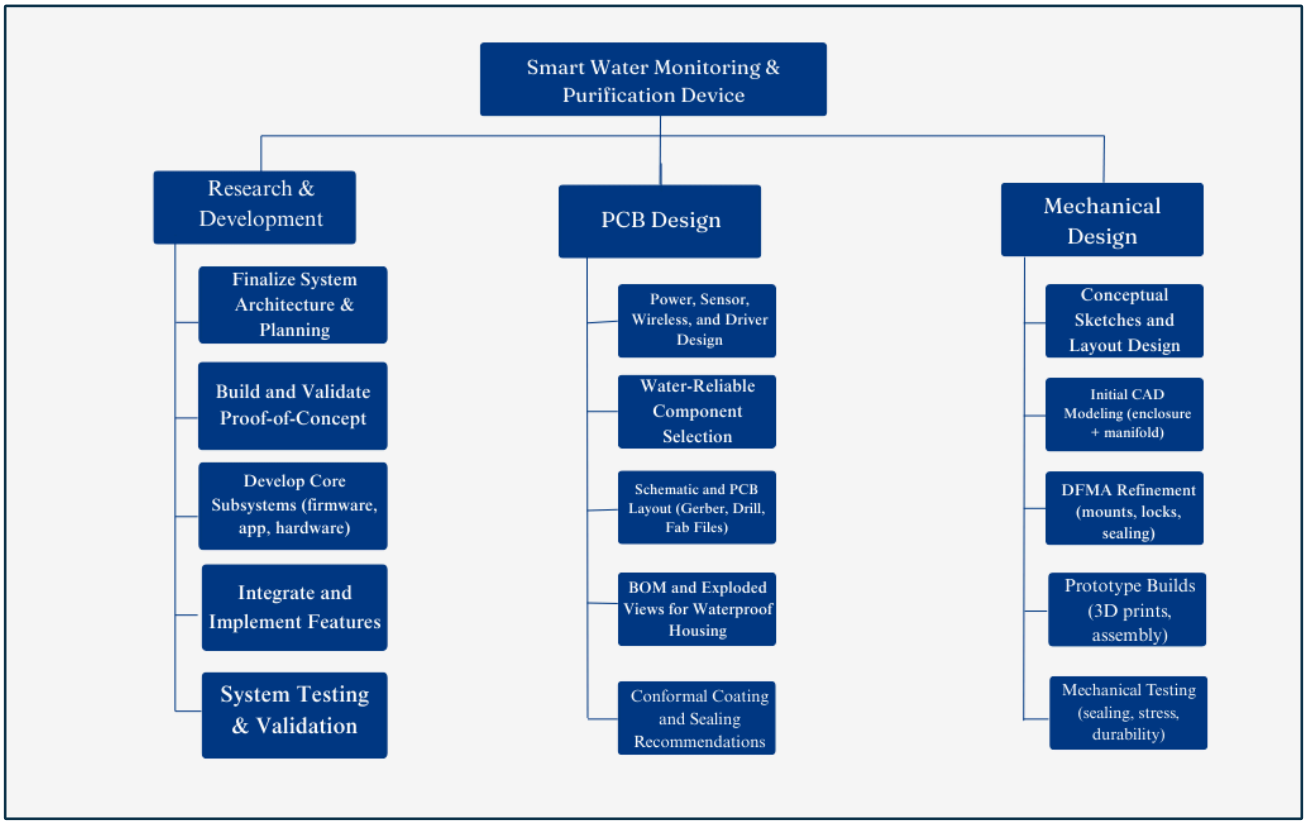
Does the stated enclosure design description apply to all devices in the system include water level monitoring?

The stated enclosure will enclose all the electronics, filter media and cartridges of the setup except the water level monitoring sensor itself, the water level monitoring sensor will be placed in the water tank where it'll be enclosed in its own separate enclosure (sometimes, the sensor doesn't require any covering enclosure, sometimes it is required, depending upon the type of sensor and position of placement). Rest of all the components and electronics will be enclosed in this single device in final prototype. The electronics of the water monitor sensor will also be inside this same enclosure just the sensor will be separate.

Total timeline for Mechanical: 148 Hours

Signature of Mechanical HOD: 

Work Breakdown Structure



KPI (Key Performance Indicator)

A measurable value that indicates how effectively the project is meeting its objectives.

Rate: 95%

Disclaimer: The KPI rate reflects the targeted performance level under planned project scope and resources. Actual outcomes may vary depending on unforeseen technical or operational challenges.

Creep (Scope Creep)

Uncontrolled or gradual expansion of project scope beyond its original objectives.

Rate: 5%

Disclaimer: The creep rate represents an estimated buffer for minor deviations. Any expansion beyond this rate will require formal change requests and client approval.

Timeline Justification

R and D

The 320-hour R&D timeline is structured to ensure the successful development of the water quality monitoring system. Initial hardware specification (40 hours) and breadboard prototyping (60 hours) validate component compatibility and integration. Firmware development (60 hours) ensures real-time performance, while core features (80 hours) handle sensor calibration and decision logic. Mobile app development (160 hours) enables seamless BLE connectivity and cloud integration. Testing (40 hours) ensures reliability, and documentation (10 hours) completes the project with detailed guides.

PCB Design

The PCB design process will begin with power, sensor, wireless, and driver design, taking about 40 hours to ensure stable power distribution and reliable signal integrity. Component selection will require 20 hours, focusing on parts with proven performance in water-prone environments to ensure long-term reliability. Schematic capture and PCB layout will take approximately 60 hours, including placement, routing, and generation of Gerber, drill, and fabrication files. An additional 20 hours will be spent preparing the BOM and exploded views to clearly illustrate PCB placement within the waterproof housing. Finally, 20 hours will be dedicated to developing conformal coating and sealing recommendations, ensuring full environmental protection and compliance with industry standards.

Mechanical Design

The design process will begin with conceptual sketches and layout, taking about 12 hours to explore alternatives. Initial CAD development of the enclosure and sensor manifold will require around 40 hours. A further 32 hours will be dedicated to DFMA refinements, including sealing and locking mechanisms. Prototyping with 3D printing and assembly will

require about 40 hours to ensure the manufacturability standards, while mechanical testing for sealing, stress, and durability will take an additional 28 hours to make the designs ready for mass manufacturing.

Signature of Deputy Director: 

Budgeting

Hourly Rate Model

Under the hourly rate model, the project timeline is estimated at 8 weeks, averaging 30 hours per week, resulting in:

Total Project Hours: 8 weeks × 30 hours/week = **240 hours**

Hourly Rate : **$40/hour**

Total Estimated Budget: 240 hours × $40/hour = **$9,600**

P.S. The total estimated cost, based on the per-hour rate, is **$9,600**. However, the final proposed budget is **$10,000**, which includes the additional **$400** to cover the cost of 5 assembled prototypes.

This model provides flexibility, with billing directly tied to the actual number of hours spent on design, development, testing, and documentation. Any scope changes must be formally approved by both parties.

*** This 7-day valid feasibility report covers labor charges only; all component, transport, and additional costs are excluded, and pricing/timeline may change with market variations.**

Client Signature:_____

CEO M. Bilal Javaid Signature:_____

Portfolio

ESP32-Based Smoothie Machine

Smart Cashless Beverage Dispenser

Muhammad Bilal Javaid

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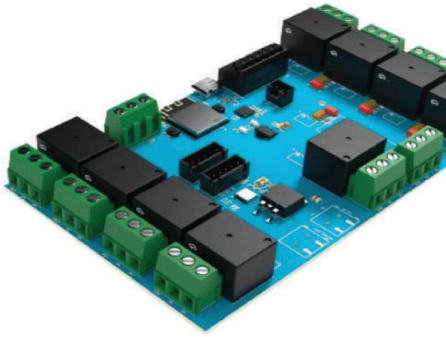
Overview & Key Features

Overview:

- The Esp32 Vending machine focuses on the design and development of a compact, gym-friendly smoothie vending machine. It mixes ingredients inside a refrigerated chamber, blends them to perfection, dispenses the smoothie, and automatically rinses the blender after each use — ensuring hygiene and convenience for every customer.In addition, the machine is equipped with a Reverse Osmosis (RO) based filtration unit to purify water before use, ensuring that every smoothie is prepared with clean and safe water.



Key Features:

- Reliable smartphone pairing and real-time status sync.
- Color-coded LEDs show social status at a glance.
- Change status via wristband buttons or mobile app.
- Discreet vibration alerts for nearby users or “nudges”.
- GPS map for locating other users, private profiles, and chat.
- Keeps LEDs off until a nearby band is detected, ensuring privacy
- RO-based filtration system removes dissolved solids, heavy metals, salts, pesticides, pharmaceuticals, bacteria, viruses, and other contaminants for pure water use.

Application:

- Social networking and ice-breaking at events,Building connections in communities or meetups, Fun and non-intrusive way to signal availability.

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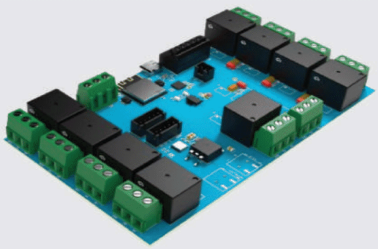
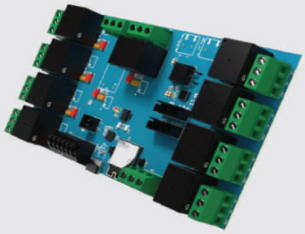
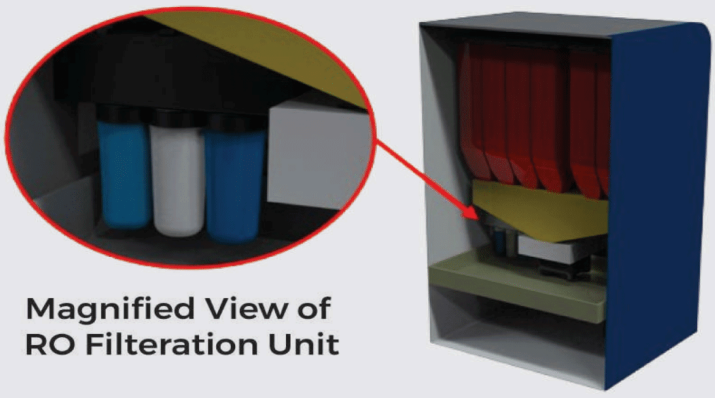


Rendered PCB



Rendered PCB



Magnified View of RO Filteration Unit

Vending Machine Internel View

Mechanical Enclosure

Solar based smart water filteration plant for irrigation

Muhammad Bilal Javaid

Muhammad Bilal Javaid

Overview & Key Features

Overview:

- This project focuses on reusing ablution water from mosque sinks for sustainable irrigation purposes. The system collects used water, filters it to remove solid particles and organic matter, and stores it for reuse in agricultural applications. Its compact, modular design allows easy installation, maintenance, and cleaning, making it practical for both small-scale and community-level deployment.

Key Features:

- Mechanically removes solid particles, suspended matter, and impurities.
- 5-liter secondary tank sized for expected ablution cycles..
- Maintains steady water flow and pressure through the system.
- Simplifies installation, cleaning, and future upgrades.
- pH levels and water clarity validated for safe irrigation use.
- Easily adapted for larger installations or extended applications.
- Designed for integration of energy recovery devices (e.g., micro water turbines).

Application:

- Mosques & Religious Centers, Community Gardens, Educational Projects,Urban Agriculture.

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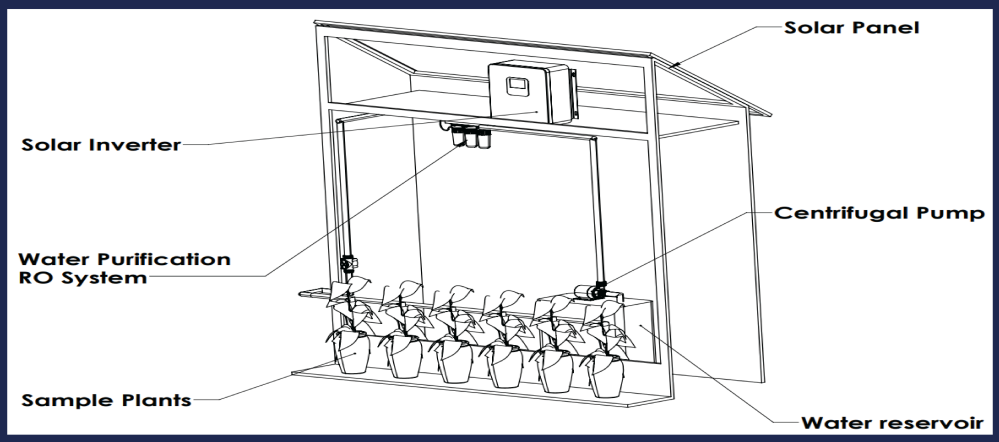

Mechanical Model Label Diagram

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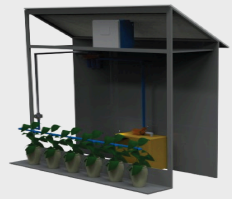


Mechanical Enclosure

Mechanical Enclosure

Mechanical Enclosure

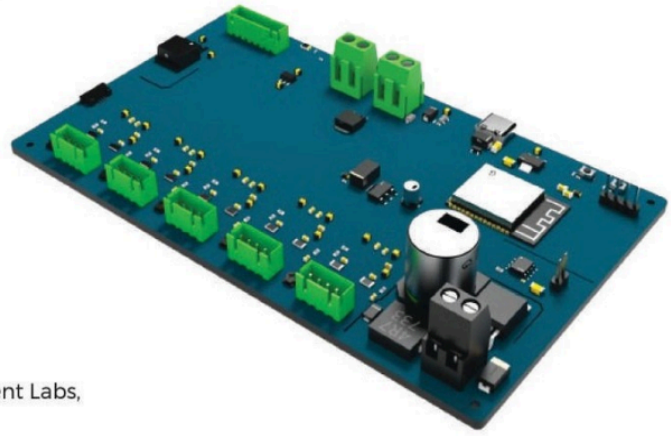
ESP32-Based Dye Colour Dispenser

Muhammad Bilal Javaid

Overview & Key Features

Overview:

- An automated solution designed for the food processing industry to precisely dispense food-grade dyes. The system uses peristaltic pumps for accurate and repeatable dosing and is paired with a mobile app that connects via Bluetooth Low Energy (BLE) for remote control and real-time monitoring. This ensures consistent color quality and simplifies production workflows for manufacturers.



Key Features:

- Delivers precise and consistent dye amounts every time.
- Connects to a mobile app via Bluetooth for easy operation.
- Shows live updates on dispensing status and quantity.
- Simple interface for quick setup and operation.
- Ensures repeatable results for consistent food color quality.
- Saves time and reduces manual effort in workflows.

Application:

- Food & Beverage Industry,Pharmaceutical Production,Research & Development Labs, Small-Scale Production Units.

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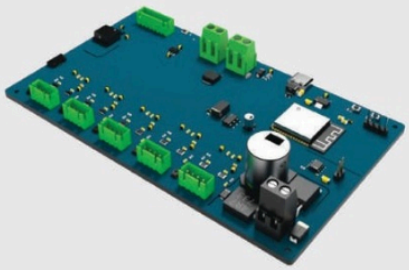

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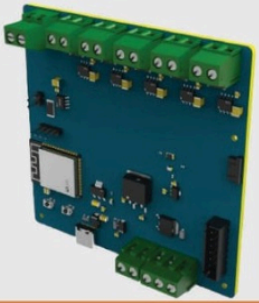

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Mechanical Enclosure

ESP32-Based Smart Fire Safety System

Muhammad Bilal Javaid

Muhammad Bilal Javaid

Overview & Key Features

Overview:

- ESP32-powered smart fire safety and monitoring system designed to detect smoke, monitor air quality, and alert users in real time. It combines wireless connectivity, automation, and a user-friendly interface to provide quick, reliable response during fire hazards.

Key Features:

- Smoke and fire detection with instant notifications.
- Continuously tracks indoor air quality for early warning.
- Wi-Fi/Bluetooth support for smartphone alerts and cloud logging.
- Can trigger fans, alarms, or sprinklers automatically.
- Simple touch-enabled panel for status and manual overrides.
- Works even without internet connection for safety-critical use.

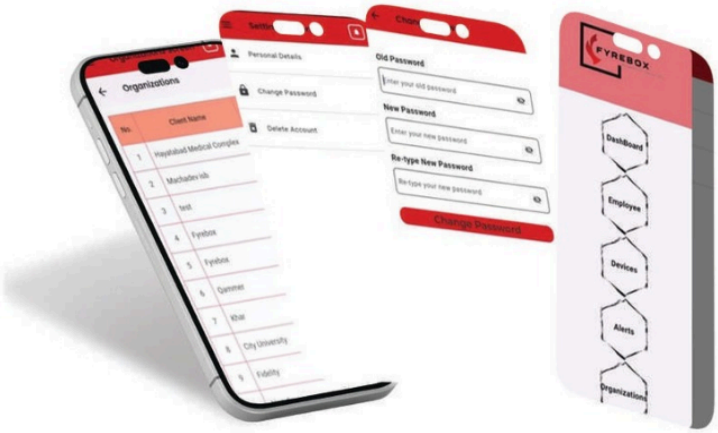
Application:

- Home and office fire detection systems,Smart building safety automation,Industrial air quality and hazard monitoring

Muhammad Bilal Javaid

App Features:

- Developed a centralized web application for managing system deployments
- Implemented real-time dashboards for alerts, sensor data, and device status.
- Supported remote device management and instant notifications.
- Included user authentication, role-based access, and automated report generation
- Designed for scalability, reliability, and compliance monitoring.



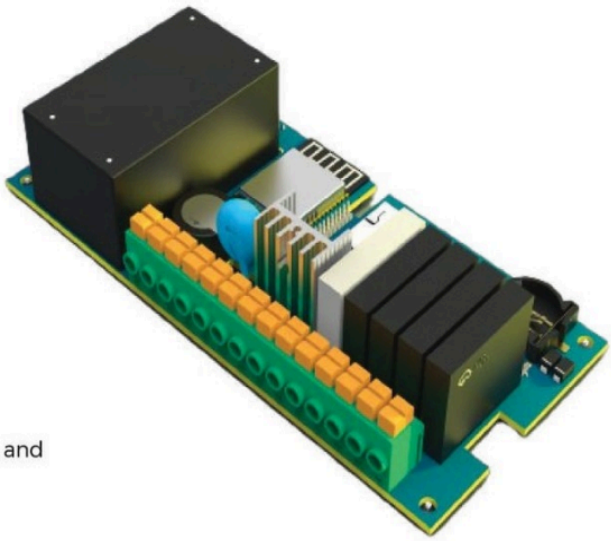
ESP32-Based Automation Product

Muhammad Bilal Javaid

Overview & Key Features

Overview:

- An IoT-enabled home automation solution powered by ESP32, designed to control lights, fans, and appliances remotely through Wi-Fi or Bluetooth. It provides real-time monitoring, scheduling, and voice assistant integration for a smarter living experience.



Key Features:

- Turn lights on/off, adjust brightness, control multiple zones, and set fan speeds.
- Live indoor temperature display and weather updates on the control panel.
- Motion-activated lights and fans, plus energy-saving single-light control.
- Built-in air quality monitoring with real-time smoke alerts.
- Touch-enabled central hub with Bluetooth/Wi-Fi connectivity, smartphone control, and offline operation for uninterrupted use

Application:

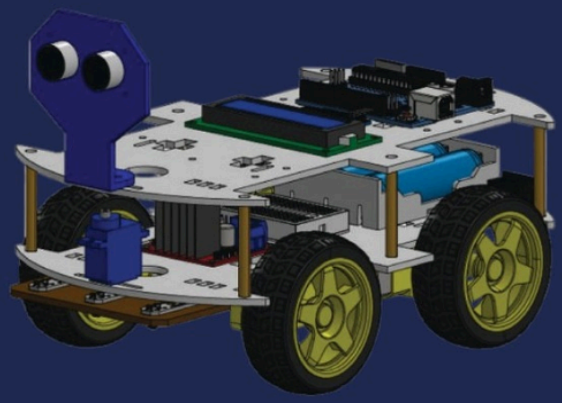
- Smart home lighting and appliance control,Energy management and monitoring,Remote home security automation

App Features:

- Turn lights on/off, adjust brightness, control multiple zones, and set fan speeds.
- Enabled real-time operation of lights, fans, and other smart devices over Wi-Fi.
- Added features like scheduling, energy monitoring, and voice assistant support
- Integrated secure login, device grouping, and scene creation for user convenience
- Designed a modern and user-friendly interface for simple navigation.
- Focused on improving everyday living through seamless smart home interaction

ESP32-Based Autonomous Guided Vehicle

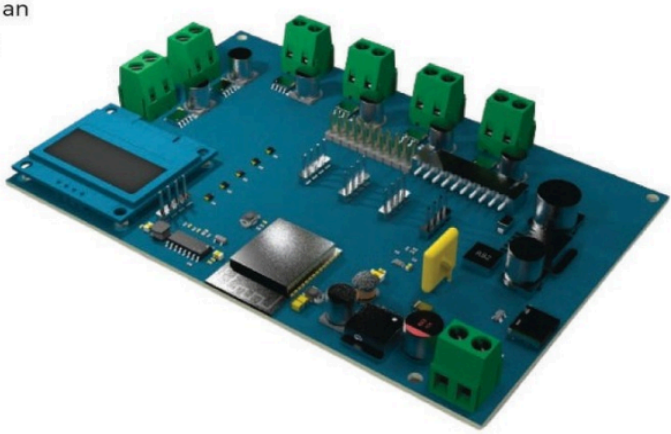
Muhammad Bilal Javaid



Overview & Key Features

Overview:

- This project focuses on creating an autonomous vehicle that can carry and monitor loads while moving in any direction using mecanum wheels. It uses an ESP32-S3 as the main controller, combining smooth motor control, collision avoidance, and real-time monitoring into one reliable system.



Key Features:

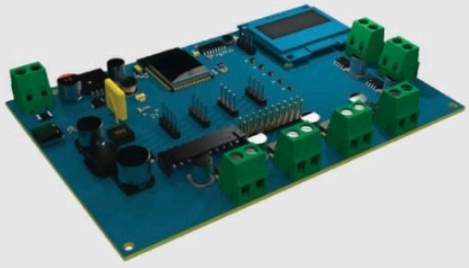
- Smooth and precise control using mecanum wheels.
- Ultrasonic sensors detect obstacles to prevent accidents.
- Built-in weight sensor shows live payload status.
- OLED screen shows weight, battery level, and system status.
- Powered by a protected Li-ion battery with regulated outputs.
- Powered by a protected Li-ion battery with regulated outputs.

Application:

- Automated material transport,Smart warehouses and factories,Research and educational robotics.

Muhammad Bilal Javaid

Rendered PCB



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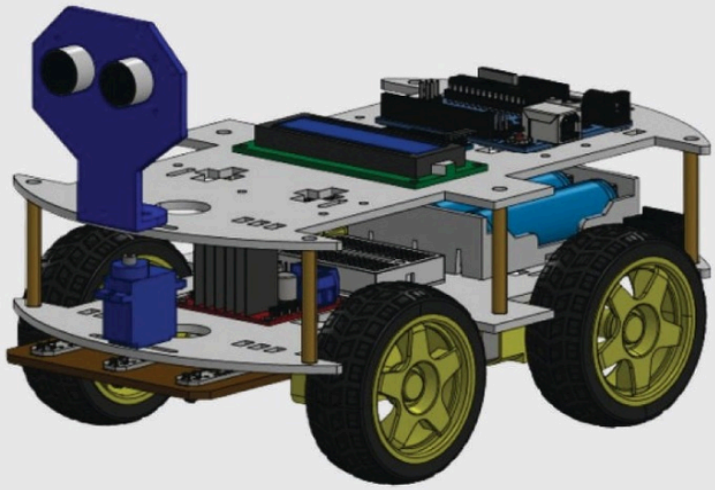
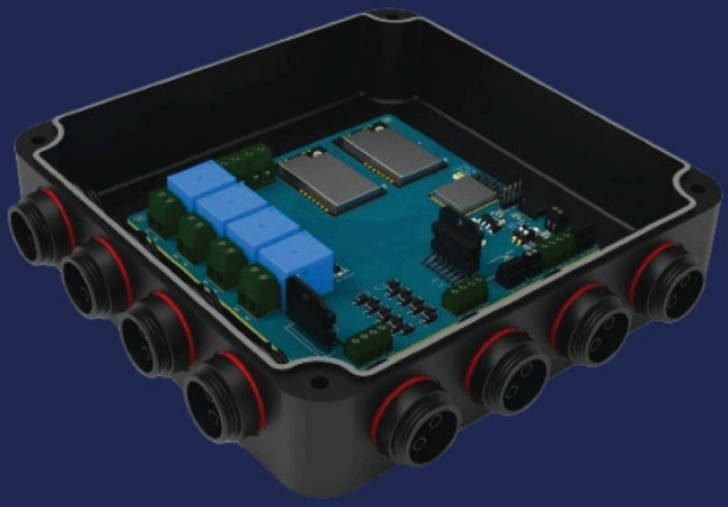


Mechanical Enclosure

ESP Based Automated Irrigation System

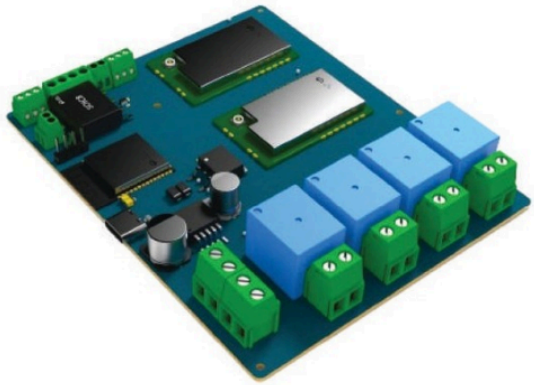
Muhammad Bilal Javaid



Overview & Key Features

Overview:

- ESP32-Based Automated Irrigation System: designed to simplify farming by automating the irrigation process. The system uses field units to control water valves and collect data like soil moisture and flow, while central units monitor and manage the entire setup from pump houses or filter stations. Weatherproof enclosures ensure durability and reliable performance in all conditions.



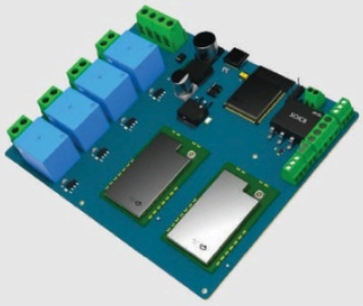
Key Features:

- Automated watering system for efficient water use.
- Real-time monitoring of soil and water conditions.
- Centralized control for the entire farm.
- Weather-resistant design for outdoor use.
- Helps save water and improve crop health.

Application:

- Smart farming and precision agriculture,Large-scale irrigation systems,Greenhouses and nurseries. Remote farm monitoring and controlWater conservation projects

Muhammad Bilal Javaid



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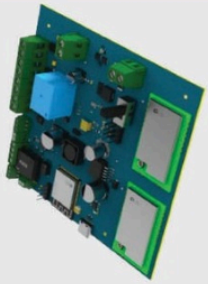


Rendered PCB

Mechanical Enclosure

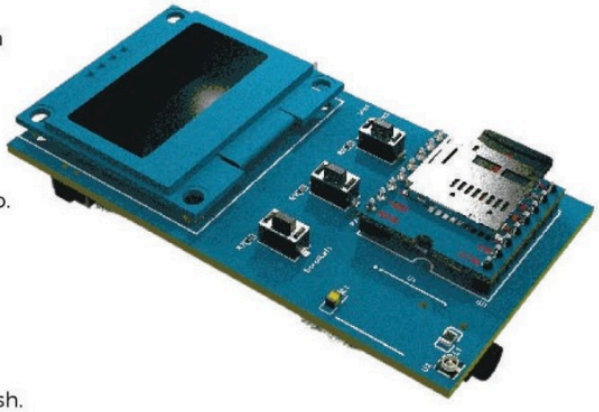
STM32-Based Pilgrimage Companion Device

Muhammad Bilal Javaid

Overview & Key Features

Overview:

- AL-Mueen is an STM32-based, event-driven pilgrimage companion that guides users through Tawaf, Sa'i, and Tasbeeh with a seamless bilingual experience. It combines a SH1106 OLED display, DFPlayer audio engine, and GNSS parser with a cooperative state machine and interrupt-driven inputs for reliable, real-time operation in demanding environments.



Key Features:

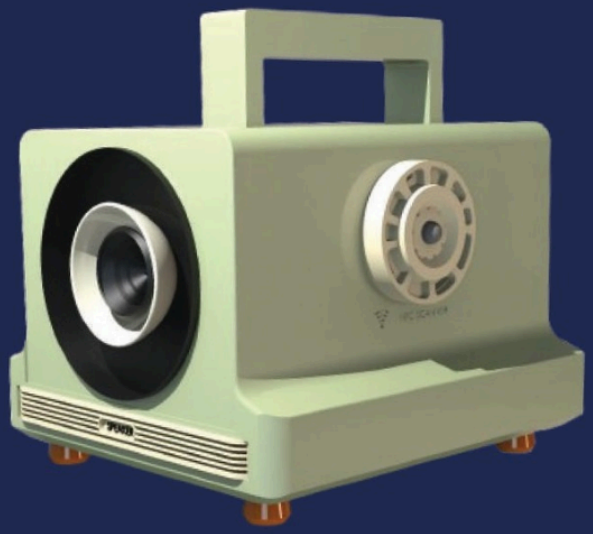
- Bilingual user experience with instant English/Arabic switching for text and audio.
- Easy-to-read screen with clear icons, arrows, battery level, and GPS status.
- Plays guidance and reminders exactly when needed.
- Provides accurate location and time updates.
- Smooth and quick response to button presses.
- Real-time toggling of language and GPS visibility with instant UI and audio refresh.
- Reliable and consistent performance for stress-free use.

Application:

- Pilgrimage guidance and ritual tracking (Tawaf, Sa'i, Tasbeeh),Real-time location and time assistance during Hajj/Umrah Bilingual guidance tool for accessible spiritual support,Portable worship aid with audio prompts and visual indicators.

Raspberry Pi Based Toy Projector:

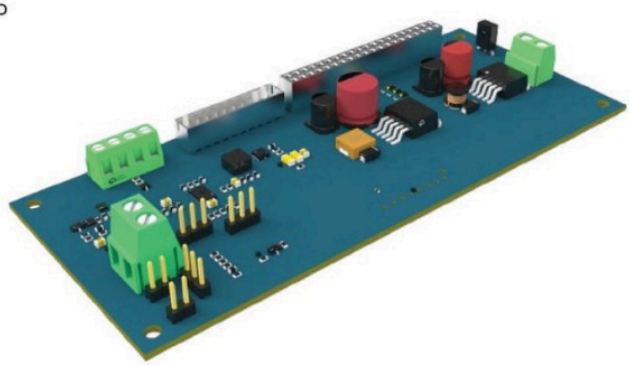
Muhammad Bilal Javaid



Overview & Key Features

Overview:

- This toy projector uses a Raspberry Pi Zero to create a fun and interactive video experience for kids. Each NFC tag unlocks a set of videos, and the projector shows a simple menu to choose what to play.



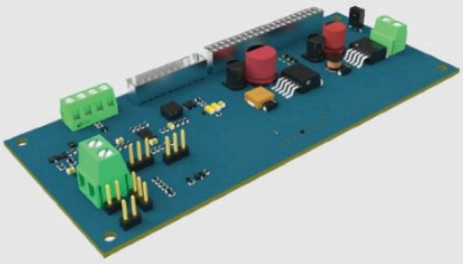
Key Features:

- Scan an NFC tag to instantly open the right set of videos.
- Play from the start, resume where you left off, or choose a different video.
- Use buttons or an IR remote to navigate and control playback.
- Pause, play, skip, and navigate videos anytime.
- Designed with a simple, colorful interface for children.

Application:

- Fun and educational toy for kids,Interactive story or video projector,zThemed video player for learning or entertainment

Muhammad Bilal Javaid



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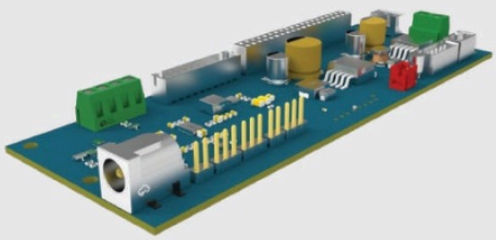


Rendered PCB

Mechanical Enclosure

Atmel Based Modular

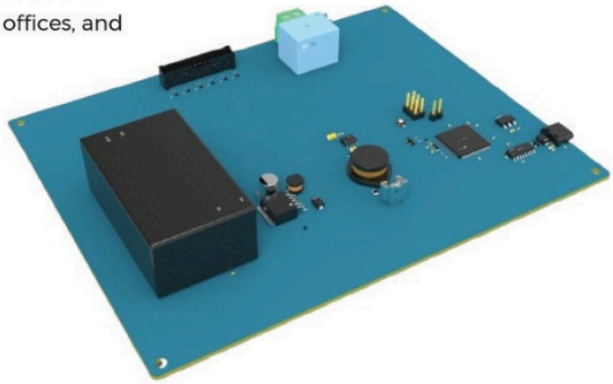
LED Lighting System

Muhammad Bilal Javaid

Overview & Key Features

Overview:

- This modular LED lighting system features five plug-and-play LED strip configurations designed for easy installation in aluminum profile housings. Each module ensures consistent brightness, efficient power usage, and safe low-voltage operation. The system is built for durability and quick replacement, making it perfect for scalable use in homes, offices, and display lighting.



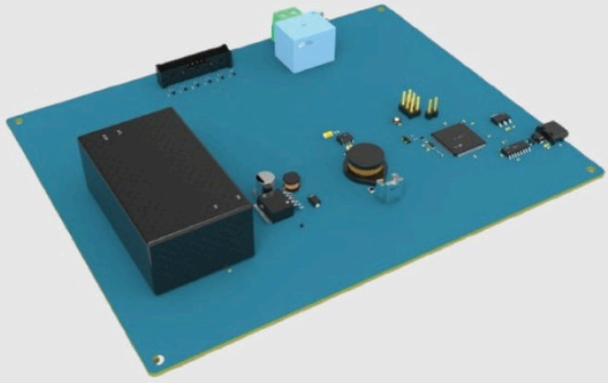
Key Features:

- Five interchangeable LED strip options for different applications.
- Optimized for maximum brightness with minimal power loss.
- Low-voltage design for safe, reliable performance.
- Plug-and-play connectors for quick setup and replacement.
- Atmel microcontrollers enable dimming, automated lighting patterns, and external controller communication
- Designed for consistent performance and long lifespan.

Application:

- Architectural and interior lighting,Retail and showroom displays,Smart home and office illumination Museum and exhibition lighting,Scalable decorative and ambient lighting solutions

Muhammad Bilal Javaid



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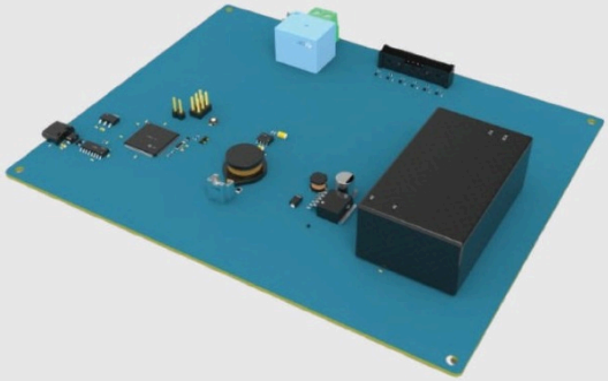

Rendered PCB

Client Feedback

Technology Officer for Electronic Product Development

Great to work with Muhammad and his team

★★★★★ Project Budget: $4,550

Pcb designer

Very professional team.

★★★★★ Project Budget: $5,250

PCB Layout

Muhammad and his team executed the project flawlessly with clear communication, quick responses, and efficient progress tracking. They handled changes smoothly and consistently aimed for fast solutions. Highly recommended for future projects.

★★★★★ Project Budget: $12,000

CAD design- Prototype

Muhammad and his team managed the project flawlessly from start to finish, with clear communication, fast responses, and excellent transparency via Google Docs. They efficiently handled changes and consistently delivered quick solutions. The client highly recommends them and would gladly work with them again.

★★★★★ Project Budget:$3,500

PCB and Electrical design for a photoreactor

I enjoy working with this group. They are talented.

★★★★★ Project Budget: $15,324

Electrical Engineer - IoT Kapton Heater Controller

Bilal and his team did good work. They are quick and communicate well, and are accommodating for any issues.

★★★★★ Project Budget: $3,658

Advance Existing Prototype - for Ultra Small Smart Flowmeter

Muhammad and his team delivered high-quality work by downsizing the PCB and choosing excellent components. Although firmware delivery took longer than expected, their accommodating nature and ability to bring in expert help led to a successful and satisfying project outcome.

★★★★★ **Project Budget: $18,000**

PCB Layout

Muhammad and his team managed the project flawlessly from start to finish, with clear communication, quick responses, and transparent progress tracking. They handled changes efficiently and delivered fast solutions. Highly recommended for future collaborations.

★★★★★ **Project Budget: $5,000**

Smart Alarm Clock With E-ink Display

Fast response time, good planning from the start and good support.
It was a pleasure to work with the team, and I hope to rehire soon again.

★★★★★ **Project Budget: $3,000**

Help Build Supplement Vending Machine Prototype

Muhammad Bilal and his team are very diligent, creative and hard working. their ability to be able to problem solve and create solutions for work moving forward has enabled the success of our project now and for the future. I would recommend to anyone.

★★★★★ **Project Budget:$ 5,000**

Schematic Design for Arduino Based Project with Stepper Motors

Exceptional product and service

★★★★★ **Project Budget: $17,312**

Automated Electric Shaver Development for Back Neck/Hairline

The team is extremely responsive and thorough. Highly recommend

★★★★★ **Project Budget: $3,658**

Thank You!

Thank you for your time and consideration. We would be happy to discuss our proposal further, address any questions you may have, and provide additional insights.

We look forward to your feedback and the opportunity to collaborate on the next steps.

CEO

MUHAMMAD BILAL JAVAID

200+	100+	30+	98%
Clients.	Project.	Countries.	Response rate