

PROJECT ABSTRACT

IoT Hostel Washing Machine Usage Monitor

An IoT monitor for shared washing machines: sensor nodes detect wash cycles per machine from vibration and current signatures, and a dashboard shows a live availability board, usage logs and maintenance alerts. Delivered built-to-order with the sensor nodes, state-machine firmware, working dashboard demo, report, PPT and viva kit.

Project type: Hardware + dashboard

Availability: Built to order

Suitable branches: IoT & Embedded, Electronics / E&TC, Computer / IT

Technologies: ESP32 sensor nodes, vibration + CT sensing, MQTT telemetry, web dashboard, Arduino IDE

Price: Request a quotation

Prepared by Projectech · projectech.in — for academic project reference.

1. Title

IoT Hostel Washing Machine Usage Monitor

2. Introduction / Background

Shared washing machines in hostels are a classic commons problem: a handful of machines serve hundreds of residents, there is no booking system, and the only way to know if one is free is to walk to the laundry room. Machines run overloaded, nobody knows which is due for service, and forgotten clothes block the next user for hours. This project instruments each machine with a compact node that recognizes the wash cycle from vibration and current signatures — fill, agitate and spin are mechanically distinct — and publishes state to a dashboard with a live availability board.

3. Problem Statement

Residents waste trips to full laundry rooms, wardens lack usage data for maintenance, and forgotten loads idle machines that others need — all because machine state is invisible. Timer-based guesses and manual registers do not reflect reality. This project makes state visible and truthful: signature-based phase detection per machine, a live FREE / WASHING / DONE board residents check on their phones, cycle-done alerts that cut idle time, and per-machine run-hours that turn maintenance scheduling into data.

4. Objectives

- Sense wash-cycle phases per machine with vibration plus supply-current signatures (external, non-invasive fitting).
- Classify IDLE / FILL / WASH / SPIN / DONE with a firmware phase state machine and debounce.
- Publish state changes immediately over Wi-Fi with heartbeat liveness.
- Accumulate per-machine cycle counts, run-hours and phase durations in the backend.
- Raise cycle-done alerts and maintenance flags (abnormal vibration, over-long cycles).
- Render a live availability dashboard and deliver the full kit: nodes, firmware, demo, guide, report, PPT, viva Q&A.;

5. Proposed Methodology

The system is built in three layers. (1) Nodes: an ESP32 with a vibration sensor on the machine body and a CT clamp on the supply cable samples both signatures; firmware runs the phase state machine with debounce timing. (2) Backend: state changes stream over Wi-Fi (MQTT/HTTP); the backend accumulates cycles, hours and phase durations and evaluates maintenance-flag rules. (3) Dashboard: the web UI renders the live availability board, per-machine stats, the done-alert feed and the flag list. Commissioning runs one supervised cycle per machine to learn its signature and set phase thresholds.

6. System Architecture / Working

Each node watches vibration energy and current draw: quiet with inlet-valve current means FILL, rhythmic agitation means WASH, sustained high vibration means SPIN. The state machine advances phases with debounce so transients do not cause flapping; sustained anomalies (excessive vibration, over-long cycle) raise maintenance flags. State changes publish immediately; heartbeats confirm liveness. The dashboard shows the live board (FREE / WASHING / CYCLE DONE), per-machine usage stats, the done-alert feed and flags. The included single-file demo dashboard runs the same interface on simulated laundry telemetry.

7. Hardware / Software Requirements

- ESP32 sensor nodes (one per machine)
- Vibration sensor + SCT-013 CT clamp per node
- Wi-Fi telemetry (MQTT/HTTP)
- Web dashboard (single-file HTML/CSS/JS demo included)
- 5 V USB power per node
- Arduino IDE (C/C++ firmware)

8. Expected Outcomes

- A working laundry monitor with a live per-machine availability board.

- Reliable phase detection validated against supervised cycles.
- Cycle-done alerts that measurably cut forgotten-load idle time.
- Per-machine usage data supporting maintenance scheduling.
- A complete report, PPT and viva Q&A; covering sensing, the state machine and the dashboard.

9. Applications

- Hostel, PG and apartment-complex laundry rooms.
- Teaching embedded state machines and applied IoT.
- Shared-appliance utilization studies.

10. Future Scope

- Booking and queue management on top of the availability board.
- Push notifications to residents' phones on cycle-done.
- Load-imbalance detection from vibration-signature analysis.
- Water/energy metering per cycle with flow and power sensing.