Smart Attendance System – Hardware Module Design

This document explains the physical design, components, and wiring structure of the Smart Attendance System. The system ensures secure attendance by requiring **one biometric authentication** (Face/Fingerprint) and **one card-based authentication** (QR/RFID).

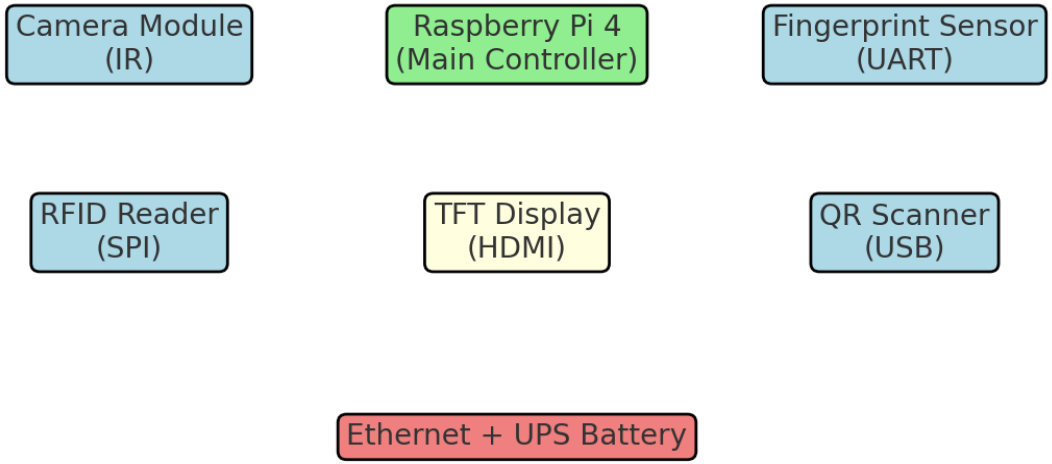
Hardware Components:

Component	Purpose
Raspberry Pi 4	Main controller (processes face, fingerprint, QR, RFID)
Camera Module (IR-enabled)	Captures face images even in low light
Fingerprint Sensor (R305/Optical)	Scans fingerprint for biometric verification
RFID + QR on Smart Card	Acts as secondary verification (card swipe/scan)
4-inch TFT Display	Shows live video feedback & verification status
Ethernet Module	Provides stable, tamper-proof connectivity
Power Supply + 5000mAh UPS Battery	Ensures operation even during power cuts

Pin Mapping & Wiring Structure:

• Camera Module → CSI Camera port on Raspberry Pi
• Fingerprint Sensor → UART (TX/RX + 5V + GND)
• RFID Module (RC522) → SPI (MISO, MOSI, SCK, SDA, 3.3V, GND)
• QR Code Scanner (USB/TTL) → USB port / UART
• TFT Display (4-inch) → HDMI/DSI Port
• Ethernet → Built-in RJ45 Port
• Battery Backup → 5V Power via UPS HAT

Smart Attendance System Block Diagram



Conclusion:

This design ensures a secure, reliable, and easy-to-use attendance system. It can work in rural schools with low resources, using Ethernet instead of Wi-Fi, and guarantees operation with a 5000mAh UPS battery backup.