

RANA HASSAN

Embedded Systems & Hardware Design Engineer

Industrial IoT | Firmware | PCB Design | ESP32/STM32 | Modbus/RS-485/Ethernet
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PROFESSIONAL SUMMARY

Embedded Systems & Hardware Design Engineer with 5+ years of experience developing production-ready firmware and hardware for industrial and commercial systems. Hands-on across ESP32/STM32 firmware, Altium PCB design, industrial communications, wireless connectivity, sensor interfacing, rapid prototyping, debugging and validation. Experienced in taking products from requirements and schematic design through PCB, firmware, integration and field-ready deployment, including isolated I/O, industrial DC power systems, Modbus/RS-485/Ethernet and IoT connectivity.

CORE TECHNICAL SKILLS

Firmware & Languages: C, C++, Python; ESP-IDF, FreeRTOS, STM32 HAL, PlatformIO, Arduino IDE

Microcontrollers & SBCs: ESP32 / ESP32-S3, STM32, Arduino / ATmega, Teensy, Seeed Studio boards, Raspberry Pi / Linux-based SBCs

Protocols & Interfaces: UART, SPI, I2C, CAN, USB, RS-485, Modbus, TCP/UDP, HTTP/HTTPS, MQTT, sockets, SNMP

Wireless & IoT: Wi-Fi, BLE, LoRa, ESP-NOW, 4G LTE (SIM7600), AWS IoT, Firebase

Hardware & PCB: Altium Designer, schematic capture, PCB layout, isolated I/O, relay interfaces, sensor integration, industrial DC power, prototyping, debugging and validation

PROFESSIONAL EXPERIENCE

Krypton Solutions - Solution Engineer 2025 - Present

- Lead research and development of anti-theft solutions for industrial applications, with focus on security, reliability and product requirements.
- Develop embedded firmware on STM32 and ESP32 platforms, improving system stability, performance and functional integration.
- Design PCB schematics and layouts for commercial products, translating system requirements into manufacturable hardware.
- Own rapid prototyping, hardware/firmware debugging and validation through functional testing and design iteration.
- Integrate Wi-Fi, Bluetooth and LoRa connectivity to support remote monitoring and connected product features.
- Work with cross-functional teams to align hardware and firmware design with customer specifications and project timelines.

Octathorn - Embedded Design Engineer 2021 - 2025

- Designed and developed custom embedded hardware and firmware solutions for international clients across industrial and commercial applications.
- Owned end-to-end embedded development, from requirements and prototyping through firmware, PCB integration, debugging and validation.
- Optimized embedded systems for performance, stability, cost-efficiency and reduced system errors.
- Integrated networking and IoT capabilities for remote monitoring, data management and connected-device operation.
- Conducted competitive product and technology research to inform system architecture and feature selection.

SELECTED ENGINEERING PROJECTS

SentinelBus-DC - Industrial Environmental Monitor

Designed a custom ESP32-S3 data-center monitoring PCB accepting 48-72 VDC through isolated DC-DC conversion. Aggregates up to 32 distributed Modbus RTU sensor nodes over galvanically isolated RS-485 across up to 1200 m; W5500 Ethernet exposes SNMP v1/v2c for Zabbix, PRTG and Nagios integration.

IsoGuard-48 Industrial Node

Developed an industrial monitoring and control node for telecom enclosures using ESP32-S3, isolated -48 V architecture, isolated RS-485 and 12+ dry-contact inputs for smoke, flood, temperature and site-alarm monitoring.

ESP32 IoT Gateway - Wi-Fi / BLE / Ethernet

Built an enclosed ESP32-WROOM-32D gateway with Wi-Fi, BLE and wired Ethernet failover, UART/1-Wire/analog sensor inputs, AWS IoT and Firebase connectivity, three 10 A relay outputs and 9-24 VDC input.

Global Smart Lock

Developed a production smart-lock platform for industrial and telecom sites with ESP32, 4G LTE/MQTT remote access, vibration tamper detection, battery failover and 48-72 VDC input.

EDUCATION & LANGUAGE

Bachelor of Electrical & Computer Engineering - University of Engineering and Technology, Taxila | 2015 - 2019

English: IELTS Overall 8.0 (December 2024) | **Urdu:** Native