VISHNU RACH K R

Embedded Systems Engineer | Bangalore, Karnataka
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Status: **Serving Notice Period (Immediate Joiner)**

PROFESSIONAL SUMMARY

Embedded Systems Engineer with **3.5 years of R&D experience** in Medical Devices, specializing in firmware development on **ARM and PSoC** platforms using Embedded C. Strong background in **board bring-up, low-level driver development, and functional safety (IEC 61508)**, with working knowledge of **hardware design** and **battery management systems**. Proven ability to bridge hardware–software integration gaps, reducing product validation cycles by 40% through automated firmware and test solutions.

TECHNICAL SKILLS

- **Firmware Development:** Embedded C, Bare Metal Programming, RTOS (µC/OS-II), ISR & Interrupt Handling, Finite State Machines (FSM)
- **Microcontrollers:** ARM Cortex-M3 (STM32, LPC1768), ARM7 (LPC2148), PSoC 4/5LP, AVR (ATmega), PIC16
- **Hardware Design & Standards:** Altium Designer, LTspice, BMS Design, Functional Safety (IEC 61508), Battery Safety (IEC 62133), ESD (IEC 61000-4-2)
- **Communication Protocols:** I2C, SPI, UART, RS-485, USB-UART
- **Peripherals:** ADC, PWM, Timers, GPIO, EEPROM
- **Tools & Debugging:** Keil uVision, STM32CubeIDE, PSoC Creator, MPLAB X, Git/GitHub, Logic Analyzers, Oscilloscopes
- **Scripting & Test:** Python (PySerial/Tkinter for Test Automation), LabVIEW, MonoDAQ

PROFESSIONAL EXPERIENCE

R&D Engineer | Litin Design Labs | Aug 2022 – Jan 2026(Serving Notice Period)
Key Projects: Infusion Pump (Class II), Holter ECG, Invasive Cardiology

- **Embedded Firmware & System Architecture:**
  - **Board Bring-up:** Led early bring-up and hardware–firmware co-debug for PSoC 4/5 architectures, stabilizing signal integrity and validating UART-based IPC protocols
  - **BMS Logic:** Designed firmware-driven Finite State Machines (FSM) for battery recovery, deep-discharge handling, and hysteresis loops using ADC-based monitoring
  - **Reliability:** Developed "Power-Off Protection" firmware to persist state data to EEPROM, ensuring automatic test resumption after power failures
- **Hardware Design & Functional Safety (Altium & Spice):**
  - **Safety-Critical Design:** Led backup battery system design for **Class II Infusion Pumps**, meeting Functional Safety (**IEC 61508)** and battery safety standards (**IEC 62133, UN38.3, UL 1642**)
  - **Power Electronics:** Simulated Buck-Boost converters in **LTspice** and designed power-path switching circuits; validated performance against load constraints
  - **Schematic Design:** Modified schematics and managed BOMs in **Altium Designer**, designing carrier boards with **MCU and SPI**, **Ethernet, RS-485, and USB-UART** interfaces
- **Automated Validation & Manufacturing Test:**
  - **Test Automation:** Reduced manual testing effort by **40%** by building modular validation systems using DAQ hardware and custom HAL drivers

- **Compliance Testing:** Executed PCBA and product-level validation including **IEC 61000-4-2 (ESD)** and environmental stress testing

Assistant Professor & Research Assistant | Vidya Academy of Science and Technology | Kerala
Jan 2016 – Aug 2022

- **Technical Lead – Product Development**
  - Architected complete hardware for an **award-winning AAC device** for NISH
  - Led design from schematic capture to PCB assembly and documentation
- **Mentorship & Training**
  - Trained **100+ engineers** in Embedded C, MCU architecture, and hardware integration
  - Developed lab curricula focused on peripheral interfacing and HW-SW co-design

Senior Research Fellow (Sabbatical) | Indian Institute of Technology (IIT), Delhi | New Delhi
Jul 2019 – Dec 2019

- Authored **STM32 firmware tutorials** and bare-metal examples (ARM Cortex-M)
- Created comprehensive documentation for peripheral configuration and programming

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KEY EMBEDDED PROJECTS

Source Code: github.com/Vishnurach/embedded-systems-portfolio

Real-Time Data Acquisition Dashboard *(ARM Cortex-M3 | LPC1768)*

- Developed **interrupt-driven bare-metal firmware** (no blocking loops)
- Built modular HAL drivers for **UART, ADC, and Timers**
- Created a **Python (Tkinter + PySerial)** desktop dashboard for real-time data visualization

RTOS Multitasking Sensor Logger *(AVR ATmega | µC/OS-II)*

- Implemented **preemptive multitasking** with queue-based inter-task communication
- Used **mutexes** to protect shared ADC resources
- Designed non-blocking tasks to preserve real-time performance

Smart Security System & HAL Library *(ARM7 | LPC2148)*

- Designed a **layered Driver Abstraction Layer (DAL)**
- Implemented simulation-aware validation for thermal faults and authentication workflows

Bare-Metal HAL Driver Library *(PIC16F877A | 8-bit)*

- Developed reusable drivers for **I2C, SPI, UART**
- Validated drivers using loopback and peripheral-specific test harnesses

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EDUCATION & PROFESSIONAL DEVELOPMENT

Advanced Diploma in Embedded Systems (Hybrid: online + in-person labs) | Quest Innovative Solutions (QIS) Academy, Kochi | 2024-2025

- Advanced C, RTOS Architecture, Low-Level Driver Development, IoT Protocols

M. Tech in Power Electronics | University of Calicut | **First Class** | 2015

B. Tech in Electrical & Electronics Engineering | University of Calicut | **First Class** | 2013

ACHIEVEMENTS

- **Outstanding Contribution Award (Dec 2024):** Accelerated Holter ECG medical device development timeline
- **First Place (State-Wide Competition - July 2022):** Developed an **AAC device** for the National Institute of Speech and Hearing (NISH)