

ENRIQUE MERCADER

MECHATRONICS ENGINEER

Chetumal, Mexico | contact@enrique-mercader.com | [linkedin.com/in/enrique-mercader](https://www.linkedin.com/in/enrique-mercader) | enrique-mercader.com
Mexican Citizen | TN Visa Eligible | Willing to relocate immediately to the United States

PROFESSIONAL SUMMARY

Mechatronics Engineer with 3+ years delivering embedded systems, power electronics, and automation solutions. Delivered measurable impact: prototyped four custom low-power BLE beacons at \$18/unit full cost (3–6× cheaper than market alternatives), eliminated 21% utility penalties via 480 kVAr capacitor bank design, and saved ~755 machine hours per week by reducing idle time of a 120+ heavy construction fleet by 17%. Expert in PIC bare-metal firmware, sine-wave PWM IGBT drives, PID control, Festo PLC, and full-stack prototyping.

PROFESSIONAL EXPERIENCE

MECHATRONICS ENGINEER & OPERATIONS SPECIALIST (FULL-TIME)

Jan 2024 – Present

E3C (Chetumal, Quintana Roo, México)

(2 Years)

- Eliminated 21% utility penalties and enabled 32% higher production at near-zero added cost at two aggregate sites by refurbishing/expanding a 240 kVAr automatic capacitor bank and building a separate 240 kVAr fixed bank from scratch, with <2-month ROI. (Details: enrique-mercader.com/projects/industrial-power-factor-correction)
- Saved approximately 755 machine hours per week across a fleet of 120+ heavy construction machines by reducing idle time from 35% to 18% (17 percentage point reduction) through real-time telemetry monitoring, 10-minute auto-shutdown configuration, operator incentives, and data-driven analysis; substantially lowered fuel consumption, engine wear, and operating expenses.
- Designed and deployed an end-to-end machine failure tracking system (Microsoft Forms → Power Automate → Excel → Microsoft Planner Kanban) for 120+ heavy construction machines across multiple sites; replaced fragmented verbal and delayed reporting with a standardized real-time workflow that created immutable audit trails, auto-assigned ownership, provided live Kanban visibility to jobsite managers, and significantly reduced overlooked issues and forgotten spare-part orders.
- Led company-wide Microsoft 365 transformation for 95 users as Global Administrator; deployed Teams, Planner, and Power BI dashboards that consolidated multiple manual reports into automated production, cost, and payroll visibility tools, eliminating daily cross-checking of printed reports and enabling faster executive decision-making.

EMBEDDED SYSTEMS ENGINEER (PART-TIME)

Jan 2023 – Dec 2023

Vamia Solutions (Mérida, Yucatán, México)

(1 Year)

- Designed and prototyped 4 custom low-power BLE sensor beacons (AC power detection, temperature, water/leak, door status) from concept to functional hardware using PIC microcontrollers as main processor + BT832L SoC with UART interfacing; developed C firmware for sensor reading, event detection, BLE advertising, low-power sleep modes, and error handling.
- Achieved production-level cost of \$18/unit (BOM + PCB fabrication + shipping + hand soldering/assembly) while outperforming market competitors (\$50–\$120); optimized firmware for ~1.5-year battery life with significant extension potential via duty cycling; identified 30–50% further cost reduction by consolidating the circuit under a single SoC.
- Rigorously tested prototypes for accurate sensing, stable BLE connectivity, and reliable operation in constrained environments; validated full hardware-firmware integration across all four sensor types prior to client delivery. (Details & media: enrique-mercader.com/projects/BLE-Beacons)

ASSISTANT LAB TECHNICIAN (SERVICIO SOCIAL – 480 HOURS)

Jan 2021 – Jul 2021

Universidad Anáhuac Mayab (Mérida, Yucatán, México)

(6 Months)

- Delivered hands-on training and technical support to over 100 engineering students in professional laboratory and workshop settings; instructed on core instrumentation (oscilloscopes, function generators, digital multimeters, power supplies, soldering, CNC mills/lathes) while proactively maintaining, troubleshooting, and repairing lab equipment across electronics, automation, and manufacturing labs to minimize downtime and support high-quality student projects.

EDUCATION

B.S. in Mechatronics Engineering

Universidad Anáhuac Mayab (Mérida, Yucatán, Mexico)

Aug 2019 – Dec 2023

GPA: 9.04/10 (equivalent to ~3.8/4.0 US scale)

SKILLS

Languages: English (C1 certified), Spanish (native)

Embedded Programming: C/C++, Assembly, PIC microcontrollers, BLE (BT832L), UART, bare-metal firmware, low-power design, PWM, PID

Power Electronics: IGBT drives, sine-wave modulation, circuit design (EasyEDA, Proteus, LTSpice), PCB layout & hand assembly

Automation & Controls: Siemens PLC (Ladder + Structured Text), Factory I/O, electropneumatic systems, control theory

Troubleshooting & Simulation Tools: Oscilloscopes, function generators, multimeters, MATLAB, Simulink

CAD/CAM: Siemens NX (parts, assemblies, drafting, manufacturing, finite element)

Data & Productivity: Power BI, Excel (Power Pivot & Query), Microsoft suite, Microsoft Project.

3-Phase Variable Frequency Drive (VFD) – Motor Control System

Designed and built from scratch a high-performance 3-phase sine-wave PWM VFD with an output frequency range of 1 Hz–3800 Hz, successfully driving a 3-phase BLDC motor up to 140 Hz. Implemented custom C firmware with a 42/84-point lookup table on PIC16F18876 microcontroller, utilized 650V high-speed IGBTs for efficient switching, hand-designed/fabricated/assembled the PCB (China fab + self-soldering), and integrated real-time gate LED visualization plus 7-segment frequency display. All code and libraries developed from scratch with emphasis on minimal resource usage and best programming practices.

Multi-PLC Automated Production Line (Festo PLCs – Real Electropneumatic System)

Led the two most complex stations in a 5-PLC, 5-station fully automated production line and delivered a perfect 10/10 while carrying the entire team on the hardest stations in one of the program's most failed courses. Designed and implemented a custom bit-mask/shifting-based serial communication protocol (functioning as UART) between PLCs to synchronize parallel processing of multiple carts and pieces. Developed advanced dynamic logic for color-based sorting, pneumatic arm operations, turn-table processing with key-switch modes, and permutation-based warehouse storage/retrieval under intense 4-hour live testing with real-time on-the-spot modifications.

3-DOF Industrial Robotic Arm (Electronics & Firmware)

Developed the complete electronics and firmware control system for a 3-DOF + gripper robotic arm using only PIC16F18876 microcontroller and DC motors (no servos or steppers allowed). Implemented PWM-driven H-bridge control with encoders and custom PID algorithms for precise position control, created UART command protocol for PC kinematics, and added RGB LED status indication for calibration, motion, idle, and error states. All firmware and libraries written from scratch focusing on efficiency and reliability.

Factory Digital Twin Simulation in Factory I/O

Individually programmed a complete digital twin of an automated factory production line with real-time PLC integration via Codesys and achieved a perfect grade due to exceptional performance. Programmed full sequencing in Ladder Diagram + Structured Text for 6 simultaneously running stations: Manufacturing, sorting/pick-and-place, automatic order filling, palletizing, and customizable warehouse storage/retrieval.