Certified Professional Diploma

Embedded Systems & IoT

Practical Training on Real World Industrial Projects

Target Learners: Undergraduates and Job Professionals

Pre-requisite: Basic computer technological skills

Duration: 4 Months (2 sessions each week = Total 32 sessions)

Credit Hours: 64 (4 Hours each week)

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Enrollment Form: https://forms.gle/wHUTGTGtAAba5AjN6

Program Overview

This 4-month, two-level certification program is designed for working professionals and undergraduate students aiming to upskill in electronics, embedded systems, microcontroller programming, and Internet of Things (IoT). The course progresses from foundational electronics concepts, to hands-on microcontroller programming using Arduino, and finally into modern IoT systems using ESP32, cloud dashboards, and wireless communication protocols.

Key Takeaways

By the end of the full 4-month Embedded Systems & IoT Program, learners will be able to:

- Understand and apply core electrical and electronic principles while working confidently with components such as resistors, capacitors, inductors, diodes, transistors, sensors,

and transducers.

- Build, test, and troubleshoot electronic circuits with proper component selection, power supply design, and hardware safety.
- Program microcontrollers using Embedded C, including digital/analog interfacing, PWM control, debouncing logic, sensor integration, and serial communication.
- Work with both Arduino and ESP32, utilizing advanced features like WiFi, Bluetooth, ADC/DAC, deep-sleep modes, and GPIO control.
- Design complete IoT systems using MQTT/HTTP protocols and integrate them with platforms such as Firebase, Node-RED, ThingsBoard, or custom Node.js backends.
- Implement and compare modern wireless communication technologies including RF modules, ESP-NOW, LoRa, BLE, and mesh networks.
- Develop interactive dashboards for real-time data logging, visualization, and cloud monitoring.
- Create reliable automation solutions combining electronics, embedded programming, wireless communication, and cloud technologies.
- Build practical real-world projects and a final IoT capstone, such as smart home systems, smart agriculture, GPS tracking, and environmental monitoring.

Approved by

ViLabs Academy, Advisory Board Members (ABM) comprises senior educators, industry leaders, and global technology experts who provide strategic guidance across training design and curriculum development. The Board actively reviews course content, ensures alignment with current industry demands, and validates learning outcomes against global skill standards. Their involvement guarantees that all ViLabs Academy programs remain credible, practical, and workforce-ready, giving learners and partners confidence in the quality and relevance of our education.

Software/Tools to be learn

Hardware:

- Arduino
- ESP32
- Sensors
- Motors
- Drivers

Software:

- Arduino IDE
- Node.js
- Firebase/ThingsBoard/Node-RED
- GitHub

Course Outline

LEVEL 1 - Foundations of Electronics & Embedded Systems (Duration: 2 Months)

Module 1: Electrical & Electronic Fundamentals (Weeks 1–2)

- Theoretical Background: Current, voltage, power, energy
- Ohm's Law, Joule's Law
- Resistors, capacitors, inductors
- Diodes & transistors (Basic Intro)
- Power supplies & Component Selection
- Sensors & transducers

Module 2: Introduction to Microcontrollers & Arduino (Weeks 3–4)

- Microcontroller basics
- Arduino Uno architecture
- Digital I/O, Analog input, PWM
- UART Serial communication Embedded C Programming:
- Variables, loops, functions
- Debouncing logic
- Sensor interfacing code

Module 3: Mini Project (Weeks 5–8)

- Smart Temperature-Fan Control System
- Automatic Room Light Control
- Mini Weather Station
- Parking Assistance System
- Robot Car with Obstacle Avoidance

LEVEL 2 – Embedded Systems, Automation & IoT (Duration: 2 Months)

Module 4: ESP32 & Advanced Microcontroller Features (Weeks 1–2)

- ESP32 architecture
- WiFi & Bluetooth fundamentals
- GPIO, ADC, DAC, PWM
- Deep-sleep mode

Module 5: IoT Cloud & Dashboard Development (Weeks 3–4)

- IoT architecture
- MQTT & HTTP protocols
- Cloud platforms (Node.js backend, Firebase/Node-RED/ThingsBoard)
- Data logging & visualization
- IoT security essentials

Module 6: Wireless Communication Extensions (Weeks 5–6)

- RF modules (433 MHz)
- LoRa
- ESP-NOW
- Mesh networks
- BLE vs BT Classic

Module 7: Final IoT Capstone Project (Weeks 7–8)

- Smart Home Monitoring & Control System
- Smart Agriculture Automation
- GPS Tracking with Cloud Monitoring
- Air Quality Monitoring Dashboard

Projects

1. Smart Temperature-Fan Control System
2. Automatic Room Light Control
3. Mini Weather Station
4. Parking Assistance System
5. Robot Car with Obstacle Avoidance
6. Smart Home Monitoring & Control System
7. Smart Agriculture Automation
8. GPS Tracking with Cloud Monitoring
9. Air Quality Monitoring Dashboard