



Embedded Systems Design and Development

Course Objectives

- Understand the fundamentals of Embedded Systems, their architecture, and applications across industries.
- Learn to design, program, and debug embedded hardware-software solutions.
- Gain hands-on experience with microcontrollers, sensors, actuators, and communication interfaces.
- Develop skills in real-time system design, low-level programming, and hardware interfacing.
- Explore career opportunities and industry tools in embedded systems development.

Prerequisites

- Basic understanding of electronics and digital systems.
- Familiarity with at least one programming language, preferably C or C++.
- Knowledge of microcontrollers and their basic architecture is helpful but not mandatory.
- Understanding of basic communication protocols like UART, SPI, and I2C is a plus.

Tools & Environment

- Hardware: Microcontrollers (Arduino, STM32, ESP32), sensors, actuators.
- Software: Arduino IDE, Keil μ Vision, MPLAB X, STM32CubeIDE, PlatformIO.
- Languages: C, C++, Assembly, Python for prototyping.
- Debugging Tools: Serial Monitor, Logic Analyzer, Oscilloscope.

Sr.	Title	Topic	Objective
1	Introduction to Embedded Systems	Basics of Embedded Systems	Understand what embedded systems are, their characteristics, and differences from general-purpose computers.
2	Embedded System Components	Hardware & Software	Learn about microcontrollers, memory, input/output devices, and firmware.
3	Microcontrollers vs Microprocessors	Architecture	Differentiate between MCUs and MPUs, with examples.
4	Real-Time Operating Systems	RTOS Concepts	Understand real-time constraints, multitasking, and scheduling.
5	Programming Embedded Systems	C/C++ & Assembly	Write and compile programs for embedded devices.
6	Communication Protocols	UART, SPI, I2C, CAN	Learn interfacing techniques for sensors and actuators.
7	IoT and Embedded Systems	IoT Applications	Understand IoT architectures and smart device integration.
8	Debugging Techniques	Testing & Debugging	Use debugging tools and methods to test embedded applications.
9	Embedded Systems in Automotive	ECU & ABS	Explore automotive embedded systems and safety-critical design.
10	Embedded Systems in Healthcare	Medical Devices	Study examples like pacemakers and infusion pumps.
11	Low Power Design	Energy Efficiency	Design battery-powered embedded devices efficiently.
12	Embedded Systems Project	Hands-on	Build a working embedded system using MCUs and sensors.



Minimum Completion Criteria

- Complete all modules and quizzes.
- Submit at least one hands-on embedded systems project.
- Participate in weekly practical sessions.
- Maintain at least 80% attendance.

Certificate Details

Upon successful completion, learners will receive a Government-Recognized Certificate from Vidyawan, a registered MSME enterprise.



One Month Internship Certificate



Weekly Marathon Participation Certificate

Performance-Based Badge System

- Gold Badge – For Top Performers (90%+ score, completed 4+ projects)
- Silver Badge – For consistent performance (70–89%)
- Copper/Participant Badge – For all learners who complete the program

Contact Information

For queries, registration, or collaboration, feel free to contact us:

Vidyawan – Internship & Skill Development Platform

(A Government-registered MSME – UDYAM-WB-14-0205610)

- Email: contact.vidyawan@gmail.com
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