

CERTIFICATE OF SUCCESSFUL COMPLETION

Presented to
DO MINH CHINH

*Has successfully completed course assessment
and examination of*

EMBEDDED SYSTEM

(Based on the International Standards)

Awarded on this **Nov 04, 2025**

Certification Id: **IMIC-377003**



COURSE CURRICULUM

This course is designed to equip learners with in-depth knowledge and practical skills in STM32 microcontroller programming. Participants will learn how to use the HAL (Hardware Abstraction Layer) library and explore various aspects of embedded systems development. The course covers a wide range of topics, including hardware understanding, software development, and real-world applications.

- 1. STM32 Microcontrollers and HAL Library** (Reading datasheets and user manuals, Understanding schematic diagrams and basic electronic components)
- 2. Software Development with STM32CubeIDE** (Writing and debugging code in STM32CubeIDE, GPIO for digital input/output, Practical exercises in controlling LEDs and reading button states)
- 3. Interrupts and Low-Level Programming** (Implementing external and internal interrupts, Working with the vector table, NVIC peripherals in the ARM core, Understanding the boot-up process) Bootloader Development (Writing a bootloader application, Utilizing UART for sending and receiving data with a PC, Integrating UART interrupts)
- 4. Advanced Techniques** (Implementing DMA for data reception from a PC, Improving system performance through DMA, Using SPI to read data from a 3-axis gyroscope (I3G4250D sensor), Implementing I2C for working with an accelerometer and magnetometer (SM303AGR sensor))
- 5. Real-World Applications** (Application of flash memory for firmware updates over UART, Reading temperature from an internal sensor using ADC, Basic timer operations, including output compare and input capture, FreeRTOS for multitasking applications, STM32CubeIDE using makefiles and GCC, Loading firmware onto the MCU using STM32 ST-LINK Utility)



PHAM MINH QUAN