

Embedded C Training: Programming Methods and Tools for Embedded Applications - Face-to-Face Training

This training focuses on the hardware-near C-programming of 8, 16 or 32 bit microcontroller architectures. It shows you how to identify and avoid the pitfalls of C programming. You learn how to program a HW abstraction layer according to an architecture model. Operating system mechanisms and services are explained by programming a scheduler. You get an overview of the whole lifecycle of a product - from the idea to project planning, software development process, test planning, quality planning, acceptance, commissioning, operation and decommissioning.

Objectives

This training focuses on the hardware-near C-programming of 8, 16 or 32 bit microcontroller architectures.

You learn how to program a HW abstraction layer according to an architecture model. OS mechanisms and services are explained by programming a scheduler.

You get an overview of the entire lifecycle of a product - from the idea to project planning, SW development process, test planning, quality planning, acceptance, commissioning, operation and decommissioning.

You are able to efficiently develop programs for an embedded system in "C" according to the guidelines of modern software engineering.

You are familiar with using pointers, function pointers and structures.

Based on your knowledge of programming/coding guidelines and software quality features, functional and non-functional requirements as well as internal quality and generate software that is reusable, extendable and easily tested.

In addition, you know all stages of a software development process, from the idea to system acceptance.

Participants

Software developers, software architects

Requirements

A good understanding of ANSI-C and microcontroller architectures.

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Content

Introduction

- ANSI-C
- Embedded systems and their specifics
- Software toolchain
- Software architecture
- Debug features and bugs

Programming Language C for Embedded

- Hardware-near programming
- Data types
- Pointers, function pointers

- Structures, linked lists
- Circular buffer, queue, FIFO, LIFO
- Programming rules and guidelines
- Pitfalls and stumbling blocks in C

Driver Programming

- Selecting a suitable SW architecture
- HW abstraction, object-based programming
- Access to HW registers from "C"
- Interfaces, callback interfaces, queues
- Interrupt handling /service routines, callback function
- Exercises: Timer hardware abstraction plus callback

Using Pointers, Function Pointers and Linked Lists

- Programming example - scheduler
- Task management with linked lists
- Exercises: Programming a task management

Real-Time Operating Systems (RTOS) - Overview

- Types, services, selection criteria
- Function and programming of a scheduler
- Exercises: Task switch

Library Management

- Adapting standard library functions to hardware
- Generating and managing user libraries
- Exercise: Generating and integrating a library

Locating Code and Files in the (μC) Memory (Flash, RAM Address Space)

- Logical sections (.text, .data, .bss) in the build process
- Load and run addresses
- Controlling the linker through command files

Finite State Machines, FSM

- Descriptions and representation variants
- Philosophy and implementation of an FSM in C
- Exercises: Programming a traffic light control

Aspects of Embedded Software Engineering

- Software quality criteria
- Software development process models (Waterfall, V, agile)
- Functional safety
- Requirements engineering
- Verification and test
- Capability maturity models

Outlook: OOP Techniques

- Advantages and challenges of object oriented programming
- UML diagrams

Coding Guidelines

- Purpose
- MISRA-C directives and rules

MicroConsult Plus: Extensive Exercises on a Target Hardware

- The hands-on exercises are performed and tested using the Keil μVision IDE and Arm compiler on an M0-based 32-bit hardware platform.

FACE-TO-FACE TRAINING

Date	Price *	Duration
15.09.2025 – 18.09.2025	2.400,00 €	4 days
19.01.2026 – 22.01.2026	2.400,00 €	4 days

* Price per attendee, in Euro plus VAT

Training code: E-EMB-C

Live Online - English

Date	Duration
08.12. – 11.12.2025	4 days
16.03. – 19.03.2026	4 days

Face-To-Face - German

Date	Duration
19.01. – 22.01.2026	4 days

Live Online - German

Date	Duration
08.12. – 11.12.2025	4 days
16.03. – 19.03.2026	4 days

Coaching

Our coaching services offer a major advantage: our specialists introduce their expertise and experience directly in your solution process, thus contributing to the success of your projects.

We will be happy to provide you with further information or submit a quotation tailored to your requirements.