



## C1 - Effective MISRA C

*MISRA C:2023, including guidelines for safety and security supporting all published versions of the C standard*

### Objectives

- Understand the C language pitfalls, the compilation process, static analysis techniques and tools
- Understand the origin and nature of MISRA C and its role in the development of safe and secure software
- Learn all important MISRA C guidelines and the unwanted phenomena they are designed to prevent
- Understand the notion of compliance to MISRA C and the permitted deviation procedures
- Discover and understand the advantages of the adoption of MISRA C and other best practices.

### Course Environment

- Theoretical course
  - PDF course material (in English) supplemented by a printed version for face-to-face courses.
  - Online courses are dispensed using the Teams video-conferencing system.
  - The trainer answers trainees' questions during the training and provide technical and pedagogical assistance.
- At the start of each session the trainer will interact with the trainees to ensure the course fits their expectations and correct if needed

### Target Audience

- Any embedded systems engineer or technician with the above prerequisites.

## Course Outline

### Introduction

- Review of undefined, unspecified and implementation-defined behavior in C
- How the compilers may take advantage of undefined behavior
- Review of explicit and implicit casts
  - Balancing
  - Promotion
  - Arithmetic conversions
- Review of enumerated, integer and floating-point types: representation and operations.
- Review of common integer pitfalls
  - Overflow
  - Sign error
  - Extension
  - Truncation
- Review of common floating-point pitfalls
  - Error propagation
  - Comparison
  - Excess precision
- Review of arrays, strings, pointer types and associated programming errors
  - access outside bounds
  - Null-termination
  - Truncation
  - Off-by-one errors

## Comprehensive Overview of MISRA C

- Introduction to MISRA
- The purpose of MISRA C and its role in improving code quality
- The MISRA C essential type system and other preliminary notions
- MISRA C:2012 guidelines related to not fully defined behavior of C
- Test on not fully defined behavior of C and related MISRA C guidelines

## Advanced MISRA Guidelines

- Other important MISRA C:2012 guidelines.
- MISRA C:2012 guidelines for security
- Test on MISRA C violations and the best ways to deal with them.
- Properly formulating defensible claims of MISRA compliance.

## Automated MISRA C Compliance

- Automatic verification of compliance to the MISRA C rules
  - Available tools
  - Tools proper configuration and use.
- Demonstrative analysis of the MISRA C violations in real software projects
  - Along with the correct remediation measures.