

## T146 e-Learning

# Failure Mode and Effects Analysis (FMEA) incorporating FMECA and FMEDA in the context of IEC 61508

The application of IEC 61508/ IEC 61511 requires a detailed understanding of Failure Mode and Effects Analysis (FMEA). This course focuses on FMEA in the context of these two international standards. FMEA is a vital compliance requirement for the design and engineering of a safety product and/or safety instrumented system.

The goal of this course is to understand the principles of Failure Mode and Effects Analysis (FMEA), Failure Mode, Effects and Criticality Analysis (FMECA), Failure Mode, Effects and Diagnostic Analysis (FMEDA), in the context of IEC 61508, including the process and practices to perform an FMEA study.

Whilst the systems integration will be undertaken to meet the compliance requirements of IEC 61511 individual elements or devices will have been designed to meet the requirements of IEC 61508.

### Course Duration

The course is expected to be completed in full within six weeks of course licence activation.

### Course Type

This is an e-Learning training course. Delegates will be able to access the course modules and complete the course to fit in with their day-to-day workload. The modules include a series of multiple-choice worked examples. In addition a number of modules feature multiple-choice and multiple-response tests.

Successful completion of the tests allows the delegate to progress to the next module. The tests can be undertaken several times with feedback given each time a test is undertaken.



### Participant profile

This training is targeted at control and systems engineers, application engineers, especially those involved in executing safety system application projects.

### Prerequisites and Recommendations

Delegates should have knowledge of and experience in working on automation, control and safety applications, and systems. This includes selection and engineering of complex and non-complex elements/sub-systems.

### Course Objectives

Upon completion of this course the participants will:

- Gain a basic understanding of IEC 61508
- Be able to understand, at a basic level, a third-party manufacturer's data sheet developed by an FMEA process
- With technical support, be able to undertake an FMEA for a low complexity element/device (e.g. electromechanical contactor or relay)
- Be able to act as an intelligent observer when participating in a team undertaking an FMEA on a complex element/device
- Understand the relationship between the device FMEA and its integration into sub-systems and systems
- Be able to detail the FMEA process, specifically for use in demonstrating compliance to IEC 61508. (See IEC 61508-2, Annex D - Safety manual for compliant items)
- Understand the sources of failure rate, failure mode and diagnostic coverage values

## Course Outline

Details of the training course content are found in the table below, each module covering a specific topic.

Module 1	Module 2	Module 3	Module 4	Module 5	Module 6	Module 7
Introduction and Basic Concepts	Fundamentals of FMEA and FMECA	Undertaking an FMEA	Component Failure Rate Data	FMEA Outputs	Team Structure	Worked Examples
<ul style="list-style-type: none"> <li>- Course Objective and Scope</li> <li>- Underpinning Definitions and Concepts</li> <li>- Relationship with IEC 61508</li> <li>- Abbreviations</li> <li>- References</li> </ul>	<ul style="list-style-type: none"> <li>- Failure Mode Effects and Analysis (FMEA)</li> <li>- Failure Mode Effects and Criticality Analysis (FMECA)</li> <li>- Failure Mode Effects and Diagnostic Analysis (FMEDA)</li> <li>- FMEA and compliance to IEC 61508</li> </ul>	<ul style="list-style-type: none"> <li>- Sub-dividing the system into appropriate function blocks</li> <li>- Defining the application scenarios</li> <li>- Identifying the failure modes</li> <li>- Identifying the effects of different modes of failure</li> <li>- Identifying detection methods</li> <li>- Assigning failure rates</li> </ul>	<ul style="list-style-type: none"> <li>- Sources of failure rate data</li> <li>- Selecting failure rate data</li> <li>- Determining failure mode distribution</li> <li>- Failure modes of redundant components</li> <li>- Failure modes of communication channels</li> </ul>	<ul style="list-style-type: none"> <li>- FMEA outputs for specific applications</li> <li>- Functional blocks</li> <li>- Failure mode</li> <li>- Effect of each failure mode</li> <li>- Failure rates for different types of failure</li> <li>- Diagnostic coverage and method</li> <li>- Safe Failure Fraction (SFF)</li> </ul>	<ul style="list-style-type: none"> <li>- Range of required skills</li> <li>- Competence of personnel</li> <li>- Role of chair person</li> <li>- Documenting the FMEA</li> </ul>	<ul style="list-style-type: none"> <li>- Worked examples for non complex and complex devices/safety elements</li> </ul>

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## How to order

Further details can be found at:

[www.abb.com/abbuniversity](http://www.abb.com/abbuniversity)

or using the following link

<http://www.abb.com/AbbUniversity/CourseInfo/COUR2014060614455403080052.aspx>