Training Course

RELIABILITY VALIDATION FOR
TECHNICAL PRODUCTS
BASIC & ADVANCED MODULES

OVERVIEW

BASIC MODULE
This course provides details of the main principles relating to technical system reliability. Statistics and Physics of Failure methodology are combined to produce effective techniques for the validation of technical products. Fundamental theory is combined with practical examples, resulting in learning that can be immediately applied in technology development programmes.

ADVANCED MODULE
As an extension to the basis module, this course provides deeper insight into technical system reliability. The focus is on practical application of reliability methodology during the course of product development. Technical aspects are complemented by a discussion of typical challenges faced when implementing reliability processes within an organisation.

MAIN SKILLS DEVELOPED

Basic Module
- Durability assessment
- Application of physics of failure based damage models
- Test assessment
- Development and analysis of complete validation programmes

Advanced Module
- Development and verification of physics of failure based damage models
- Test design
- Validation programme management
- Warranty risk assessment

TYPICAL PARTICIPANTS
- Engineers with a background in development, validation, quality and production of technical products. Team leaders, product managers and technical management staff.

LOCATION
- Training centre at Uptime Engineering in Graz, or on location at customer premises

DURATION
- 2 days

LANGUAGE
- English or German

PRICE
- € 1500 for 2 days training at Uptime Engineering in Graz

for bookings contact: office@uptime-engineering.com
## COURSE STRUCTURE – BASIC

### DAY 1

**Introduction**
- Overview of system reliability, economical aspects, boundaries and limitations
- State of the art in reliability assessment, typical challenges in practice
- Overview of methods and tools
- Process design for reliability demonstration

**Methods and Terminology**
- Definition of the field of reliability
- Repairable vs. non-repairable objects and reliability modelling
- Definition and evaluation of reliability indices

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### DAY 2

**Physics of Failure**
- Introduction to Physics of Failure
- Damage indicators vs. failure mechanisms
- Failure mechanism oriented system analysis
- Standard models and damage calculation
- Challenges in practical applications

**Test and Validation Programme Design**
- Target definition and allocation
- Component maturity demonstration; hierarchical test sequences
- Test evaluation; acceleration vs coverage
- Quantification of validation programme potential
- Programme optimisation (sequence, quantity, duration and allocation of tests)

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### INCLUDED EXERCISES

- Practical examples and exercises relating to system reliability assessment
- System analysis and damage calculation
- Test design, component maturity demonstration and test allocation

## COURSE STRUCTURE – ADVANCED

### DAY 1

**Introduction**
- Methodology and practical challenges of reliability demonstration
- State of the art in various industries
- Return on validation investment
- Implementation of methods and process design for reliability demonstration

**Basis of Reliability Methodology**
- Reliability demonstration: required number of samples and duration of tests
- Reliability growth
- Design and evaluation of databases for load spectra, maintenance, failures

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### DAY 2

**Physics of Failure**
- Model development (induction, deduction, abduction)
- Hypothesis testing, model calibration and validation
- Transfer functions from global observables to local loads
- Acquisition of loads and determination of load capacity
- Data management
- Component specification and quality systems

**Test and Validation Programme Design**
- Test-Design and –allocation, distributed validation
- Integration of reliability methodology in the product development process
- Moderation and conflict management within and outside the organisation (developer, supplier, OEM's)
- Progress monitoring, failure evaluation, dynamic test programme optimisation, guarantee cost estimation

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### INCLUDED EXERCISES

- Concept for implementation of a reliability process
- Early warning for series failure
- Architecture of a field failure monitoring database
- Generation of hypotheses and critical tests for real cases, damage calculation
- Extension of technical specification with input from system analysis
- Review: Software tools, experience, potential, limitations
- Optimization of a validation program execution after various failure cases

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