The Teachers

Mr. Antonio Castellani has more than twenty years of experience in Reliability and Logistics Engineering. He is involved both in technical and management activities in Space and Defense Projects. As Reliability Engineering Manager, he was involved in large programs, like IRIDIUM, Astrolink, Cosmo SkyMed, Cosmo Second Generation, GÖKTÜRK.

The Company

Since 1974, INTECS has been operating at the forefront of the software market, where safety, reliability, innovation, and quality are essential ingredients for success. INTECS provides leading-edge software technologies to support the major European and Italian organisations in the design and implementation of advanced electronic systems for Defence, Space, and Civilian markets.

Intecs is ISO-9000 certified since 1994. Currently it holds ISO 9001:2008 quality certification for software development in Defense, Space, and Civilian domains. Moreover, Intecs Defence and ATC Divisions were positively appraised at CMMI® Maturity Level 3.

General Information

Location

Courses may be arranged in-house at the customer site upon request.

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the Brainware company

Dependability Theory

A three-days modular course

Dependability Theory

Dependability theory consists of two basic approaches:

➢ Prediction: evaluates Reliability, Availability, Maintainability (RAM) parameters characterising a system, by probability models determining MTTFs, MTTRs from inputs based upon system architecture and technology;

➢ Estimate: evaluates Reliability, Availability, Maintainability (RAM) parameters characterising a system, by system field data determining MTTFs, MTTRs by fitting field data to a suitable failure distribution.

Dependability is addressed by four ECSS standards: ECSS-Q-ST-30C – Dependability, ECSS-Q-ST-30-09C – Availability Analysis, ECSS-Q-ST-30-02C - Failure modes, effects (and criticality) analysis (FMEA/FMECA), ECSS-Q-ST-40-12C - Fault tree analysis.

MIL standards also address system dependability by providing methods and models to evaluate components failure rate (MIL-HDBK-217F), and establishing proceedings to evaluate system MTTFs, MTTRs (MIL-HDBK-338B).

The Course

The objective of the course is to make available Dependability Theory fundamentals, also addressing basic probability theory elements, so that participants can start RAM, FMEA/FMECA, and FTA analyses on systems from early design phase, up to operations.

The course is organized in three days:

- Day 1: introductory discussion of probability basics, including main discrete and continuous distributions; Reliability related definitions and analysis methods, Reliability Block Diagrams (RBDs) and Markov analysis.

- Day 2: detailed discussion of Maintainability and Availability definitions and relevant analysis methods.

- Day 3: : detailed discussion of Failure Mode, Effects, (and Criticality) Analysis (FMEA/FMECA); Fault Tree Analysis (FTA).

Examples and exercises are significant part of the lessons.

Intended audience

At least large part of Day 1 should be attended by:

- Project Managers and System Engineers who need to understand how to manage Reliability, Maintainability, Availability requirements in their projects.

Day 1, Day 2, and Day 3 should be attended by:

- Dependability Analysts who need to understand the approaches and models to be applied in Reliability Assurance process to be carried out within a system design and development project.

- System Designers and Developers who need to understand how to integrate actual design activities with Reliability requirements assurance process.

Prerequisites

Participants are required to master calculus fundamental concepts. Some previous knowledge of probability theory and related applications is desirable.

Benefits

Most of Day 1 course will primarily familiarize managers and engineers with Dependability definitions and evaluation methods. They will then be able to interact with own customers, higher-level project managers, their development teams, and suppliers (if any). Moreover, they will know where to find more information, when necessary.

In Day 2 and Day 3 course Dependability Analysts and System Designers and Developers will be provided with analysis tools and methods to be applied in complex system projects.

Material

The participants are provided with a copy of the course handouts, including examples and exercises.

Course Outline

Day 1

Overview of probability theory basic concepts:
Introduction to Dependability Theory
Repairable and non-repairable systems
Failure Distribution
Mean Time To Failure, Failure Rate
Reliability Block Diagram (RBD)
Series, parallel, stand-by and complex configurations
Analytical method
Monte Carlo method
Reliability requirements allocation
Reliability prediction
Failure on-demand
Markov Analysis

Day 2

Maintainability Repair process
Time To Repair Distribution
Mean Down Time
Maintainability
Mean Time Between Failures (MTBF)
Availability
Dormant Failures

Day 3

FMEA/FMECA
FTA
Qualitative Analysis
Quantitative Analysis
Comparison between Fault Tree and Reliability Block Diagram approaches