

Related Courses

- [Reliability Engineering](#)
- [Root Cause Failure Analysis & Experiment Design](#)
- [Leading/Facilitating Root Cause Failure Analysis \(RCFA\)](#)
- [Root Cause Analysis of Systems Failure – Comprehensive](#)
- [FMEA: Failure Modes & Effects Analysis](#)
- [TRIZ for Systematic Innovation](#)
- [Innovate with TRIZ: Contradiction Analysis](#)
- [Unleashing Engineering Creativity – Comprehensive](#)

Aimed At

Design, process, manufacturing, and quality assurance engineers, technicians, and others charged with failure analysis, failure prediction, or robust system design.

Course in a Nutshell

This exciting workshop offers a powerful tool kit to identify the root cause of system, subsystem, and component failures (including latent failures) and to implement optimal intermediate to long-term corrective actions and robust design alternatives. These techniques, first perfected in the semiconductor industry (which faces exacting system design, failure prevention, and failure analysis requirements), have been adapted to work for any engineering organization.

With the help of real-life case studies and hands-on projects, you will learn how to analyze and prevent failures using: Cause and effect chains, failure anticipation analysis, failure mode effect analysis, functional analysis, and contradiction analysis; also, how to design more robust solutions using: Ideality, ideal final result, system trimming, innovation design principles, technically-focused brainstorming, smart little people, and solution evaluation techniques.

Upon course completion, you will know how to identify dominant failure modes, identify the root causes of systems failures, select and implement effective corrective actions, generate robust design solutions, and work as an inter-organizational, multi-disciplinary failure analysis team. The course includes a copy of the presentation materials as well as a root cause analysis field guide.

Customize It!

Whatever the nature of your system and objective, whether failure prevention, cause determination, or design improvement, we will customize the course to meet your specific requirements. Here are some of the ways in which we can tailor the course to help you get more out of it:

- Add a “workshop day” to the course to allow the participants to work together to analyze failures specific to your organization. It can be scheduled a few weeks after the course to allow time for applying the technologies presented in class under a failure analysis and solution design expert’s guidance.
- Schedule post-class follow-up consultation for continuing in-house product and process failure analyses.

Learn How To

- Work together in an effective multi-disciplinary team environment to resolve existing and potential complex system failures.
- Objectively identify all potential failure causes using functional modeling, cause and effect chain analysis, and other technologies.
- Proactively eliminate potential failure causes before they occur.
- Design your existing or new system for anti-failure robustness.

Course Outline

Day 1: Root Cause Failure Analysis

- **Introductory Concepts:** Understand the basics behind the root cause theories, system ideality (system value) and how system value can only be advanced by root cause resolution.
 - **Root Cause Analysis** principles
 - **Understanding the Problem:** The first and most important step in any problem-solving methodology
 - **Systems versus Component Failures**
 - **Ideality** and system value as driven by the continuous improvement of failure analysis
 - **Class Exercise:** Write Ideal Final Result statements for existing commercial or industry challenges
 - **Case Study**
- **Identifying Potential Failure Causes**
 - **Understand the Strengths and Limitations of:**
 - Fault tree analysis
 - The 5-Why’s technique
 - Ishikawa diagrams
 - Flow charting

- FMEA
- **Cause and Effect Chain (CEC):** Learn how to use the most effective and versatile root cause analysis tool.
 - Introduction
 - Known versus theoretical issues
 - CEC construction
 - And/or relationships
 - Root causes
 - Class Exercise: Build a practice CEC of your choice
- **FMEA:** Learn how to merge CEC and FMEA functionality to accelerate time to solution
- **Group Project Work:** Create a CEC for your team project

Day 2: Root Cause Failure Analysis (continued)

- **Functional Analysis:** Learn the most powerful technique for fully understanding a complex system's operation and how it will help you capture and understand all potential failure modes
 - Functional language
 - Component analysis
 - Interaction analysis
 - Functional Modeling (FM)
- **Class Exercise:** Build a practice FM of your choice
- **Orchestration of Functional Modeling and CECs:** Understand how CECs and FMs are directly related and augment each other
- **Class Exercise:** Coordinating your Class Exercise CECs and FMs (what did you miss on your CEC exercise and what did you miss on your FM exercise)
- **System Trimming:** Learn how to increase your system's value while reducing the system componentry, thereby reducing failure modes, maintenance requirements and system costs
- **Class Exercise:** Trim your practice FM to increase the represented system's value
- **Group Project Work:** Create an FM for your team project
- **Failure Anticipation Analysis:** Learn how to predict system failures and understand if they are possible or not based on understanding the available system resources
- **Contradiction Analysis:** Understand the fundamental requirements for innovative system advancements which increase system value and reduce failure modes.
 - What are Contradictions and why are they important?

- Contradiction modeling
- **Group Project Work:** Develop contradiction statements from problem areas in your group project FM and for the roots of your CEC

Day 3: Solution Generation

- **Innovation Design Principles:** Learn powerful principles for resolving system contradictions that are derived from an empirical study of over four million worldwide patents
 - Introduction to the 40 Principles
 - Choosing the correct principles
 - Applying the principles
- **Resource Analysis (for solutions):** Understand how to look for locally available resources in support of solution generation
- **Class Exercise:** Save the passengers of the Titanic
- **Technically Focused Brainstorming:** How to eliminate this methodology's weak points while leveraging its strengths
- **Group Project Work:** Apply the selected 40 Principles to the resolution of your group project FM and CEC contradictions
- **Smart Little People:** Learn a powerful empathy technique to support solution generation and design
- **Class Exercise:** Utilize the Smart Little People technique on one of the contradiction statements you have developed
- **Solution Evaluation Techniques:** Learn a simple technique to effectively judge solution concepts against term and quality
- **Course Wrap-up:** Course recap, Q/A, participant project reports, evaluation and feedback, and directions for future study