

Course No. 1305

Reliability Engineering Training Course

RELIABILITY & ASSET MANAGEMENT
INDUSTRIAL ENGINEERING, MAINTENANCE & OPERATIONS

DURATION

5 Days

DELIVERY

Classroom



Course Overview

The Reliability Engineering Training Course provides a comprehensive professional framework for understanding, analyzing, and improving the reliability of equipment, systems, and operational processes. The course develops the technical and analytical capabilities required to identify failure mechanisms, evaluate reliability performance, predict equipment behavior, and develop practical strategies that improve availability, maintainability, safety, and lifecycle performance.

Reliability Engineering plays a critical role in organizations that depend on continuous operation, complex equipment, and high asset availability. A structured reliability approach enables organizations to move beyond reactive failure management and develop proactive strategies based on failure data, engineering analysis, risk, asset criticality, and operating conditions. This helps organizations make better decisions regarding equipment design, maintenance strategies, inspection, condition monitoring, spare parts, and lifecycle investments.

The course covers the core principles and advanced applications of Reliability Engineering, including reliability concepts, failure distributions, reliability metrics, failure mechanisms, statistical analysis, reliability prediction, maintainability, availability, failure data analysis, Weibull analysis, FMEA, FMECA, Root Cause Analysis, Reliability-Centered Maintenance, and reliability improvement programs. Participants will learn how these methodologies can be integrated to understand why assets fail and how their performance can be systematically improved.

Through practical exercises, engineering case studies, reliability calculations, failure data analysis, and workshops, participants will develop the ability to evaluate equipment reliability and identify opportunities for improvement. The course emphasizes practical application and decision making, enabling participants to translate reliability analysis into maintenance strategies, engineering improvements, risk reduction measures, and asset performance initiatives.

Objectives

- Analyze the fundamental principles, terminology, and applications of Reliability Engineering within asset-intensive organizations.
- Develop a structured understanding of reliability, availability, maintainability, failure behavior, and lifecycle performance.

- Evaluate equipment and system reliability using appropriate reliability metrics, failure data, and engineering analysis techniques.
- Apply statistical and probability-based methods to analyze failure behavior and reliability performance.
- Assess failure mechanisms, failure patterns, and reliability trends using historical equipment and maintenance data.
- Apply Weibull analysis and other reliability techniques to identify failure distributions and support engineering decisions.
- Evaluate the impact of equipment design, operating conditions, maintenance practices, and human factors on reliability.
- Design reliability improvement strategies based on failure analysis, asset criticality, risk, and operational requirements.
- Strengthen the integration of Reliability Engineering with FMEA, FMECA, Root Cause Analysis, RCM, condition monitoring, and maintenance optimization.
- Improve maintenance strategies by applying reliability principles to preventive, predictive, and condition-based maintenance.
- Develop reliability performance indicators for monitoring equipment and system performance.
- Prepare a practical Reliability Engineering improvement program with measurable priorities, actions, and performance measures.

Who Should Attend

The Reliability Engineering Training Course is designed for professionals responsible for equipment reliability, maintenance, engineering, asset performance, operations, and technical improvement. It is particularly suitable for Reliability Engineers, Maintenance Engineers, Asset Engineers, Mechanical Engineers, Electrical Engineers, Instrumentation and Control Engineers, Process Engineers, Equipment Engineers, Maintenance Planners, Reliability Specialists, Condition Monitoring Specialists, and Technical Services Professionals.

The course is also relevant to Reliability Managers, Maintenance Managers, Engineering Managers, Asset Managers, Operations Managers, Plant Managers, Maintenance Superintendents, Maintenance Supervisors, and professionals responsible for developing reliability programs, analyzing equipment failures, optimizing maintenance strategies, improving asset availability, and managing technical risks.

Executives, senior managers, project managers, engineering leaders, consultants, and technical decision makers can benefit from understanding how reliability analysis supports engineering and business decisions. The course is applicable to manufacturing, power generation, utilities, transportation, mining, infrastructure, petrochemicals, oil and gas, process industries, and other organizations where equipment reliability and operational continuity are important.

Learning Outcomes

- Explain the principles, terminology, objectives, and applications of Reliability Engineering.
- Calculate and interpret key reliability, availability, and maintainability measures.
- Analyze equipment failure data and identify meaningful reliability trends and patterns.
- Apply probability and statistical techniques to evaluate equipment failure behavior.
- Use appropriate reliability distributions and models to characterize failure patterns.
- Perform and interpret Weibull analysis for equipment and component failure data.
- Identify dominant failure mechanisms and assess their effect on system reliability.
- Evaluate the influence of design, operation, maintenance, environment, and human factors on asset reliability.
- Apply FMEA and FMECA principles to identify and prioritize reliability risks.
- Use Root Cause Analysis and reliability data to develop sustainable corrective actions.
- Integrate Reliability Engineering principles with RCM, condition monitoring, and maintenance optimization.
- Develop a practical reliability improvement plan supported by performance indicators and measurable actions.

Course Outline

DAY 01

Foundations of Reliability Engineering

- Introduction to Reliability Engineering and its role in modern asset management
- Reliability terminology, concepts, principles, and engineering objectives
- Relationship between reliability, availability, maintainability, and operational performance
- Reliability versus quality, durability, resilience, and safety

DAY 01 — CONTINUED

- Reliability block diagrams and basic system reliability concepts
- Series, parallel, standby, and redundant system configurations
- Component and system reliability
- Failure rate, mean time between failures, mean time to failure, and related indicators
- Understanding bathtub curves and equipment failure behavior

PRACTICAL APPLICATION

Calculate basic reliability and availability measures for a representative equipment system

DAY 02**Failure Data Analysis and Reliability Statistics**

- Sources and quality of reliability and failure data
- Failure data classification and preparation
- Probability distributions used in reliability engineering
- Exponential, normal, lognormal, and Weibull distributions
- Failure rate and probability density concepts
- Reliability and unreliability functions
- Mean Time To Failure and Mean Time Between Failures
- Statistical interpretation of equipment failure patterns
- Censored and incomplete failure data

PRACTICAL APPLICATION

Analyze a sample equipment failure dataset and determine reliability characteristics and failure trends

DAY 03**Weibull Analysis, Failure Mechanisms and Reliability Modeling**

- Fundamentals of Weibull analysis
- Weibull parameters and their engineering interpretation

DAY 03 — CONTINUED

- Shape, scale, and location parameters
- Identifying infant mortality, random failure, and wear-out behavior
- Weibull plots and interpretation of reliability data
- Selecting appropriate reliability models
- Failure mechanism identification and physical failure behavior
- Reliability prediction and reliability modeling
- System reliability and reliability allocation concepts

PRACTICAL APPLICATION

Perform a Weibull analysis and develop recommendations based on the identified failure pattern

DAY 04

Reliability Improvement and Maintenance Strategy

- Identifying reliability improvement opportunities
- Failure Mode and Effects Analysis and Failure Modes, Effects & Criticality Analysis
- Root Cause Analysis and systematic failure investigation
- Asset criticality and risk-based reliability improvement
- Reliability-Centered Maintenance and reliability strategy development
- Preventive, predictive, and condition-based maintenance from a reliability perspective
- Condition monitoring and early detection of equipment deterioration
- Design improvement, redundancy, protection, and engineering modifications
- Spare parts and maintenance resource considerations

PRACTICAL APPLICATION

Develop a reliability improvement strategy for a critical asset based on failure data and risk analysis

DAY 05

Reliability Program Development and Continuous Improvement

- Developing an organizational Reliability Engineering framework
- Establishing reliability objectives and performance indicators
- Reliability KPIs for equipment, systems, maintenance, and operations
- Reliability improvement programs and action prioritization
- Integrating reliability engineering with asset management and maintenance management
- Reliability data management and performance reporting
- Monitoring reliability trends and validating improvement actions
- Developing reliability standards, procedures, and review mechanisms
- Continuous improvement and lifecycle reliability management

FINAL WORKSHOP

Complete an integrated reliability assessment and develop a practical Reliability Engineering improvement program with priorities, actions, KPIs, and implementation milestones

Register or Request More Information

Course page: <https://quest-training.com/courses/reliability-engineering-training-course>

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