

PROBLEM SOLVING & DECISION MAKING SKILLS FOR ENGINEERS AND TECHNICAL PROFESSIONALS



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Introduction

Engineering problems rarely arrive neatly defined. A pump fails intermittently, a batch drifts out of specification, a project slips without a clear cause, and the data available supports several explanations. This Problem Solving & Decision Making Skills for Engineers and Technical Professionals Training Course builds the discipline needed in that situation. Learners study structured problem definition, root cause analysis, and quantitative decision methods used in technical environments. Furthermore, the course covers failure analysis, risk assessment, and how to justify a recommendation to non-technical stakeholders. As a result, participants solve technical problems systematically and defend their decisions on evidence.

Problem Solving & Decision Making Skills for Engineers and Technical Professionals Course Objectives

- Define technical problems precisely using the MECE principle and issue trees.
- Apply root cause analysis with the 5 Whys and fishbone diagrams.
- Use FMEA (Failure Mode and Effects Analysis) to prioritise technical risks.
- Conduct structured failure investigation with fault tree analysis.
- Apply statistical thinking, including variation and process capability analysis.
- Use the DMAIC framework from Six Sigma for process improvement projects.
- Evaluate alternatives with weighted decision matrices and costbenefit analysis.
- Apply decision trees and expected value analysis under uncertainty.
- Stress-test decisions with premortem analysis and sensitivity checks.
- Document and present technical recommendations with clear evidence trails.



Course Methodology

This course combines short lectures with engineering-focused case work. Participants investigate real technical failures, run root cause clinics, and defend recommended solutions before a review panel. Trainers use industrial case studies, data interpretation exercises, and structured peer critique. Group debriefs examine which analysis method changed the conclusion. In addition, participants build a personal problem-solving and decision toolkit.

Who Should Take This Course

- Engineers across mechanical, electrical, process, and civil disciplines
- Maintenance, reliability, and plant engineers
- Quality engineers and continuous improvement specialists
- Technical project managers and engineering leads
- Production supervisors handling recurring technical issues
- R&D and product development technical staff
- Technical consultants supporting industrial clients

Problem Solving & Decision Making Skills for Engineers and Technical Professionals Course Outlines

Day 1: Defining Technical Problems

- Why technical problems are often misdiagnosed
- Problem definition with the MECE principle and issue trees
- Separating symptoms from root causes
- Framing the problem statement and success criteria



- Data gathering: what to measure and why
- The 5W2H method for problem scoping
- Problem definition clinic on real equipment issues

Day 2: Root Cause and Failure Analysis

- The 5 Whys technique and its limitations
- Fishbone (Ishikawa) diagrams for cause classification
- Fault tree analysis for systematic failure investigation
- FMEA: severity, occurrence, and detection ratings
- RPN calculation and risk prioritisation
- Weibull and reliability basics for failure patterns
- Failure investigation workshop

Day 3: Analytical and Statistical Problem Solving

- Variation, common cause, and special cause
- Process capability analysis: Cp and Cpk
- Control charts for process monitoring
- Sampling, measurement error, and data quality
- Hypothesis testing basics for technical decisions
- The DMAIC framework for improvement projects
- Data analysis lab with real process data

Day 4: Decision Making Under Constraints

- Structuring decisions: criteria, weights, and scoring
- Weighted decision matrices and Pugh analysis

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- Costbenefit analysis and lifecycle costing
- Decision trees and expected value under uncertainty
- Risk assessment with probabilityimpact matrices
- Premortem analysis and sensitivity testing
- Decision simulation with engineering trade-offs

Day 5: Implementing and Communicating Decisions

- Turning analysis into an action plan with owners and dates
- Piloting changes and verifying results
- PDCA and the verification of corrective actions
- Writing technical recommendations and justification reports
- Presenting to non-technical stakeholders
- Building a personal problem-solving toolkit
- Final case presentation and action plan

Conclusion

By successfully completing Problem Solving & Decision Making Skills for Engineers and Technical Professionals, participants will gain a practical understanding of how to define technical problems accurately, find their real causes, and choose solutions on measured evidence rather than intuition. They will be able to run structured failure investigations, apply statistical and risk-based methods, and justify recommendations to technical and non-technical audiences. In addition, they will know how to verify that a fix actually worked. Gentex Training Center designed this course so that learners return to work with methods they can apply to the next failure or design decision.





FAQs

Q1 What is the "Problem Solving & Decision Making Skills for Engineers and Technical Professionals" course about?

It teaches structured technical problem solving and evidence-based decision making. Participants cover problem definition, root cause and failure analysis, statistical methods, risk assessment, and decision evaluation using industrial case work and real data.

Q2 What are the key benefits of the "Problem Solving & Decision Making Skills for Engineers and Technical Professionals" course?

Participants diagnose failures more accurately, reduce repeat problems caused by treating symptoms, and choose solutions that hold up under review. They also justify technical recommendations with defensible analysis and cut the cost of trial-and-error changes.

Q3 What skills will I gain from the "Problem Solving & Decision Making Skills for Engineers and Technical Professionals" course?

You will gain technical problem definition and analysis, root cause and failure investigation, statistical and risk-based evaluation, and decision structuring and recommendation reporting. These four skills combine to make your technical judgement both sharper and more defensible.



Q4 What tools, methods, or standards are covered in the "Problem Solving & Decision Making Skills for Engineers and Technical Professionals" course?

The course covers the MECE principle, issue trees, the 5W2H method, the 5 Whys, fishbone diagrams, fault tree analysis, FMEA with RPN prioritisation, process capability analysis (Cp and Cpk), control charts, the Six Sigma DMAIC framework, weighted decision matrices, Pugh analysis, decision trees, and probability impact risk matrices.

Q5 How is the "Problem Solving & Decision Making Skills for Engineers and Technical Professionals" course applied in real-world practice?

Professionals apply it to equipment failures, quality deviations, process capability problems, design trade-offs, maintenance strategy decisions, and capital justification cases. The methods transfer to any technical situation where the cause is unclear and the decision carries real cost.