

QualityTrainingPortal Courses															
COURSE TITLE	Course Type Master 1 credit Comprehensive coverage of a broad topic Targeted** ½ credit Narrow focus on one small aspect of a broader topic	Estimated Hours	TARGET AUDIENCE								DOMAIN		COURSE COMPONENTS		
			Quality Dept Personnel	Engineers	Operators	Managers	Supervisors	Support Staff	All Levels	Manufacturing	Non Manufacturing	Units	Tests	PDF Guide	
8-D Problem-Solving*	Master Course	7	✓	✓	✓	✓	✓	✓	✓	✓	✓	2	2	Y	
Advanced Control Charts	Targeted Course	3	✓	✓			✓			✓		1	1	Y	
Advanced Process Capability	Targeted Course	3	✓	✓			✓			✓		1	1	Y	
Advanced SPC	Master Course	6	✓	✓			✓			✓		1	1	Y	
Control Chart Basics	Targeted Course	2.5	✓		✓					✓		1	1	Y	
DMAIC Problem-Solving	Master Course	7	✓	✓	✓	✓	✓	✓	✓	✓	✓	2	2	Y	
DOE: Screening Experiments	Master Course	8	✓	✓			✓			✓		3	3	Y	
Error-Proofing Business Processes	Master Course	5				✓		✓			✓	1	1	Y	
FMEA Investigator	Master Course	7	✓	✓	✓	✓	✓			✓		3	3	Y	
FMEA Investigator for the Office	Master Course	5						✓			✓	2	2	Y	
Fundamentals of APQP	Master Course	6	✓	✓			✓			✓		1	1	Y	
Gage Mentor	Master Course	9	✓		✓					✓		3	3	Y	
Introduction to Lean Six Sigma	Targeted Course	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	1	1	Y	
Introduction to Six Sigma	Targeted Course	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	1	1	Y	
Introduction to the 5S's	Targeted Course	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	1	1	Y	
Lean for Business Processes	Master Course	2.5						✓			✓	1	1	Y	
Lean Implementation	Targeted Course	1.5		✓			✓	✓		✓		1	1		
Lean Manufacturing*	Master Course	15	✓	✓	✓	✓	✓	✓	✓	✓		3	3	Y	
Lean Process Layouts	Targeted Course	2.5		✓			✓			✓		1	1	Y	
Lean Support Processes	Targeted Course	2						✓			✓	1	1		
Mapping Office Workflows	Targeted Course	2						✓			✓	1	1	Y	
Measurement System Analysis	Master Course	7	✓	✓			✓			✓		2	2	Y	
Mistake-Proof It!	Master Course	7	✓	✓	✓		✓			✓		4	3	Y	
Overview of APQP	Targeted Course	1.5					✓	✓		✓		1	1	Y	
Overview of Lean	Targeted Course	1.5					✓		✓	✓		1	1		
Overview of Root Cause Analysis	Targeted Course	2	✓	✓	✓	✓	✓			✓		1	1	Y	
Process Capability Basics	Targeted Course	1.5	✓		✓					✓		1	1	Y	
Role of a Champion	Targeted Course	3					✓	✓		✓	✓	1	1	Y	
Root Cause Analysis	Master Course	5	✓	✓			✓	✓		✓	✓	2	2	Y	
Six Sigma Start-Up	Master Course	3	✓	✓	✓	✓	✓	✓	✓	✓		1	1	Y	
Six Sigma Start-Up for the Office	Master Course	3						✓			✓	1	1	Y	
SPC Workout	Master Course	5	✓	✓	✓		✓			✓		2	2	Y	
SPC Workout for the Office	Master Course	5					✓				✓	2	2	Y	
The 5S's: Workplace Organization	Master Course	5	✓	✓	✓		✓	✓		✓		2	2	Y	
The Basics of DMAIC	Master Course	5	✓	✓	✓	✓	✓	✓	✓	✓	✓	1	1	Y	
The Lean Mindset	Targeted Course	1.5	✓	✓	✓	✓	✓			✓		1	1	Y	
Understanding Variation	Targeted Course	2.0	✓		✓					✓		1	1	Y	
Value Stream Mapping	Targeted Course	2	✓	✓			✓			✓		1	1	Y	

*Also available in Spanish.

**Not all Targeted Training Courses are available to individual learners –however, all TTC's are available to workgroup and corporate subscribers.

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MASTER COURSES AT A GLANCE			
COMPREHENSIVE TRAINING IN A SPECIFIC TOPIC PRICED AT 1 CREDIT PER LEARNER PER COURSE			
Course	Est. Hrs. (CEUs)	Target Audience	Units/Tests
STATISTICAL TECHNIQUES			
SPC Workout (Service/Office Version Available)	6 (0.6)	Operators, Engineers, Supervisors, Quality Techs	3 Units / 3 Tests
Advanced SPC	6 (0.6)	Engineers, Supervisors, Quality Techs	2 Units / 2 Tests
DOE: Screening Experiments	8 (0.8)	Engineers, Supervisors, Quality Techs	3 Units / 3 Tests
Measurement System Analysis	7 (0.7)	Engineers, Supervisors, Quality Techs	2 Units / 2 Tests
PROCESS IMPROVEMENT/PROBLEM-SOLVING			
8-D Problem-Solving (Spanish Version Available)	7 (0.7)	All levels	2 Units / 2 Tests
DMAIC Problem-Solving	7 (0.7)	All levels	2 Units / 2 Tests
The Basics of DMAIC	5 (0.5)	All Levels	1 Unit/1Test
FMEA Investigator (Service/Office Version Available)	7 (0.7)	Operators, Engineers, Supervisors, Quality Techs	3 Units / 3 Tests
Mistake-Proof It!	8 (0.8)	Operators, Engineers, Supervisors, Quality Techs	4 Units / 3 Tests
Error-Proofing Business Processes	5 (0.5)	Business support staff, non-manufacturing personnel	2 Units / 2 Tests
Root Cause Analysis with Corrective Action	5 (0.5)	Engineers, Supervisors, Quality Techs	1 Unit / 1 Test
Fundamentals of APQP	6 (0.6)	Engineers, Supervisors, Quality Techs	1 Unit / 1 Test
COMPANY WIDE QUALITY IMPROVEMENT INITIATIVES			
Six Sigma Start-Up (Service/Office Version Available)	3 (0.3)	All levels	1 Unit / 1 Test
Lean Manufacturing (Spanish Version Available)	15 (1.5)	All levels in manufacturing	3 Units / 3 Tests
Lean for Business Processes	5 (0.5)	Business support staff, non-manufacturing personnel	1 Unit / 1 Test
SHOP FLOOR IMPROVEMENT			
The 5S's: Workplace Organization	5 (0.5)	Operators, Engineers, Supervisors, Quality Techs	2 Units / 2 Tests
Gage Mentor	9 (0.9)	Operators, Engineers, Supervisors, Quality Techs	3 Units / 3 Tests

All of Our Courses Feature
<ul style="list-style-type: none"> ➤ Student test scores and bookmarks are tracked. Documentation for ISO 9000, QS-9000 and TS-16949 records. ➤ With our web-based training you can manage learners for an entire corporation through one web-based account OR with a Corporate Subscription, we can link directly to your LMS for a seamless login. ➤ Media-rich presentation including full audio and graphics. Exercises throughout to help reinforce learning. ➤ Solid technical content presented in an interesting and informative way. ➤ Complete learner control to navigate through the program in a way that best meets learners' needs. ➤ Certificates are awarded upon successful completion of courses providing documentation of Continuing Education Units that can be used for various professional certifications.

TARGETED TRAINING TOPICS AT A GLANCE			
SHORT(ER) NARROWLY FOCUSED COURSES PRICED AT ½ CREDIT PER LEARNER PER COURSE			
Course	Est. Hrs. (CEUs)	Target Audience	Units/Tests
Advanced Control Charts	3.0 (0.3)	Engineers, Supervisors, Quality Techs	1 Unit/1 Test
Advanced Process Capability	3.0 (0.3)	Engineers, Supervisors, Quality Techs	1 Unit/1 Test
Control Chart Basics	2.5 (0.3)	All levels	1 Unit/1 Test
Introduction to Lean Six Sigma	1 (0.1)	All levels	1 Unit / 1 Test
Introduction to Six Sigma	1.0 (0.1)	All levels	1 Unit/1 Test
Introduction to the 5S's	2.0 (0.2)	All levels	1 Unit/1 Test
Lean Implementation	1.5 (0.2)	Supervisors, Engineers	1 Unit/1 Test
Lean Process Layouts (Micro-Mapping)	2.0 (0.2)	All levels	1 Unit/1 Test
Lean Support Processes	2.0 (0.2)	Support Staff	1 Unit/1 Test
Mapping Office Workflows	2 (0.2)	All levels in transactional operations	1 Unit / 1 Test
Overview of APQP	1.5 (0.2)	Managers and Supervisors	1 Unit/1 Test
Overview of Lean	1.5 (0.2)	All levels	1 Unit/1 Test
Overview of Root Cause Analysis	2.0 (0.2)	Engineers, Supervisors, Quality Techs	1 Unit/1 Test
Process Capability Basics	1.5 (0.2)	All levels	1 Unit/1 Test
Role of a Champion	3 (0.3)	Supervisors, Engineers	1 Unit / 1 Test
The Lean Mindset	1.5 (0.1)	All levels	1 Unit/1 Test
Understanding Variation	2.0 (0.2)	All levels	1 Unit/1 Test
Value Stream (Macro-Mapping)	2.0 (0.2)	All levels	1 Unit/1 Test

All of Our Courses Feature
<ul style="list-style-type: none"> ➤ Student test scores and bookmarks are tracked. Documentation for ISO 9000, QS-9000 and TS-16949 records. ➤ With our web-based training you can manage learners for an entire corporation through one web-based account OR with a Corporate Subscription, we can link directly to your LMS for a seamless login. ➤ Media-rich presentation including full audio and graphics. Exercises throughout to help reinforce learning. ➤ Solid technical content presented in an interesting and informative way. ➤ Complete learner control to navigate through the program in a way that best meets learners' needs. ➤ Certificates are awarded upon successful completion of courses providing documentation of Continuing Education Units that can be used for various professional certifications.

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SPC Workout (Basic SPC) Course Outline:

**Unit 1 - Statistics
Primer**

Lesson 1: Introduction to Variation

- What variation is and why it is a problem in any process.

Lesson 2: Measuring Variation

- Using a histogram to show the variation in a process.

Lesson 3: Patterns of Variation

- Types of patterns of variation, what they tell you, and what to do about them.

Lesson 4: Measures of Variation

- Statistical measures of variation: mean, range, and standard deviation.

Lesson 5: Normal Curve

- Properties of the normal curve and the 68-95-99.7 Rule.

Lesson 6: Stability

- The importance of a stable process.

Challenge: An assessment of the learner's progress in this unit.

**Unit 2 - Control Chart
Basics**

Lesson 1: What are Control Charts?

- What control charts are and why they are used.

Lesson 2: What a Control Chart Looks Like

- Common elements of all control charts.

Lesson 3: Interpreting Control Charts & Taking Action

- Out-of-control patterns and what to do when they occur.

Lesson 4: Types of Control Charts

- Variable and attribute control charts: Which do you use when?

Lesson 5: Using Variable Control Charts

- Calculating and plotting data and interpreting variable-data charts.

Lesson 6: Using Attribute Control Charts

- Calculating and plotting data and interpreting attribute-data charts.

Challenge: An assessment of the learner's progress in this unit.

**Unit 3 - Process
Capability Basics**

Lesson 1: What is Process Capability?

- What process capability means and why it is important.

Lesson 2: Measuring Process Capability

- The capability ratio, process capability index, and Cpk.
- Process performance indices, Ppk and Pp.

Challenge: An assessment of the learner's progress in this unit.

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Advanced SPC Course Outline:

Unit 1 - Advanced Control Charting

Lesson 1: Setting Up Variable Control Charts

- Five steps for setting up baseline variable control charts.
- Interpreting the control chart.
- Taking action to improve the process.

Lesson 2: Setting Up Attribute Control Charts

- Setting up p, np, c, and u charts.
- Interpreting the control chart.
- Taking action to improve the process.

Lesson 3: More Patterns of Instability

- The 4 common Western Electric tests of instability.
- The 14 "Other (Western Electric) Unnatural Patterns of Variation."
- Comparisons of Western Electric, AIAG, Nelson, & Boeing rules of instability

Lesson 4: Setting Up Individuals & Moving Range Control Charts

- Calculating control limits and establishing a baseline chart for IX & MR Charts.

Lesson 5: Special Control Charts & Applications

- Variations on the standard variable data control charts.
- Four variations of the R Chart.
- Five variations of the x-bar Chart.
- Twelve common control chart formats.

Challenge: An assessment of the learner's progress in this unit.

Unit 2 - Advanced Process Capability

Lesson 1: Conducting a Process Capability Study

- How-to conduct a process capability study.

Lesson 2: Taking Action to Improve the Process

- What to do if the process is not capable.

Lesson 3: More Capability Indices Pp & Ppk.

- Differences between Ppk & Cpk.
- Cpm & Ppm.

Lesson 4: Process Capability Study Complications

- Using individuals instead of subgroups.
- Compensating for tool wear.
- Skewed Distribution.
- One-sided specs.
- Short Run processes.

Lesson 5: Six Sigma Capability

- Explanation of Six Sigma quality.
- How to use Z-values.

Challenge: An assessment of the learner's progress in this unit.

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DOE: Screening Experiments Course Outline:

Unit 1 Background for DOE

Lesson 1: Why DOE?

- Limitations of OATs (one-at-a-time) experimentation.
- How designed experiments overcome the limitations of OATs and are a more effective and efficient way to characterize and improve processes and products.

Lesson 2: DOE Terminology

- An explanation of the key terms used in designed experiments.

Lesson 3: Types of Designed Experiments

- Full Factorials.
- Fractional Factorials.
- Screening Experiments.
- Response Surface Analysis.
- EVOP.
- Mixture Experiments.

Lesson 4: Tests of Significance

- Alpha and Beta Risks.
- Degrees of Freedom.
- Hypothesis Tests.
- t-Tests.
- F-Tests.

Lesson 5: Setting Up a Designed Experiment

- Design & Communicate the Objective.
- Define the Process.
- Select a Response and Measurement System.
- Select Factors to be Studied.
- Select the Experimental Design.
- Set Factor Levels.
- Final Design Considerations.

Challenge: An assessment of the learner's progress in this unit.

Unit 2 - Plackett-Burman Experiments

Lesson 1: Plackett-Burman Matrices

- The derivation of Plackett-Burman designs.
- Types of Plackett-Burman matrices.
- Ways to determine the experimental error.
- Techniques for analyzing experimental results.

Lesson 2: Calculating Statistical Significance

- Multiple techniques for testing the statistical significance of factor effects.
- Using graphical techniques to analyze responses and interactions.

Lesson 3: Calculating a Prediction Equation

- Developing a prediction equation using factor effects.
- Using the prediction equation to optimize the process or product.

Lesson 4: Analyzing for the Effect on Variation

- How to analyze variation as a response.
- Creating a scree diagram to graphically analyze factor effects on variation.

Lesson 5: When Bad Things Happen to Good Experiments

- The need for good planning to prevent problems.
- Some techniques for salvaging an experiment if data are lost or suspect.

Challenge: An assessment of the learner's progress in this unit.

Unit 3 - Taguchi Techniques

Lesson 1: Taguchi Concepts

- The concept of robustness.
- The Taguchi Loss Function.
- Signal to noise ratios.

Lesson 2: Taguchi Matrices

- Taguchi designs for two-level experiments.
- Use of Taguchi Interaction Tables.

Lesson 3: Taguchi Experimental Analysis

- Multiple techniques for testing the statistical significance of factor effects.
- Using graphical techniques to analyze responses and interactions.

Lesson 4: Determining Where to Set Factors

- Developing a prediction equation.
- Use the mean, signal to noise ratio, and variation effects to determine where to set factors.

Lesson 5: When Bad Things Happen to Good Experiments

- The need for good planning to prevent problems.
- Some techniques for salvaging an experiment if data are lost or suspect.

Challenge: An assessment of the learner's progress in this unit.

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Measurement System Analysis (MSA) Course Outline:

Unit 1 - Analyzing Measurement System Variation

Lesson 1: Variation in Measurement Systems.

- A review of sources of measurement system variation.
- An explanation of Type A and Type B evaluations of measurement uncertainty.
- Exploration of the effects of too much variation on measurements.

Lesson 2: Measurement System Linearity.

- How to measure gage/instrument linearity (both graphically and mathematically) to determine if a gage (or instrument) has linearity problems.
- Taking action to deal with linearity problems.

Lesson 3: Measurement System Stability.

- How to evaluate gage/instrument stability using a control chart.
- Taking action to deal with stability problems.

Lesson 4: Repeatability & Reproducibility.

- How to conduct a GR&R study.
- R&R analysis for non-destructive measurements.
- Use of ANOVA for GR&Rs.
- R&R analysis for destructive measurements.
- R&R analysis for attribute measurements.
- Graphical techniques to analyze R&R.

Lesson 5: Improving Measurement Systems.

- Using a problem-solving approach to find the root causes of repeatability and reproducibility problems.
- Using the GR&R data to help direct the problem-solving effort.
- A description of some basic causes to investigate if gage/instrument repeatability is high.
- A description of some basic causes to investigate if appraiser reproducibility is high.

Lesson 6: MSA Software Considerations.

- Suggested selection criteria for features of software programs for analyzing GR&R studies.
- An overview of some of the advanced measurement system analysis tools that a GR&R software package may have.

Challenge: An assessment of the learner's progress in this unit.

Unit 2 - Managing Measurement Systems

Lesson 1: Formal Instruments Management.

- Why a gage/instrument calibration program is so important and makes good business sense.
- Why a gage/instrument may not be accurate.
- The components of a gage/instrument management system.

Lesson 2: Sources of Measurement Error.

- Measurement errors due to gage/instrument calibration deficiencies.
- Measurement error related to gage/instrument usage or damage.
- Errors of judgment resulting in measurement errors.
- GR&R issues and measurement error.

Lesson 3: Calibration Practices.

- A discussion of common calibration practices.
- Key elements of a calibration system as defined by ISO 10012-1.
- Gage/instrument identification techniques.
- Sources for calibration procedures and independent calibration laboratories.
- Methods for determining intervals of calibration.

Lesson 4: Calibration Standards & Tools.

- Traceability of calibration standards from primary national standards to working standards.
- The role of transfer standards and working standards.
- Measurement uncertainty and the calibration system.

Lesson 5: Calibration Pitfalls.

- Common instrument management system pitfalls.
- Proactive techniques to steer your organization clear of these pitfalls.

Lesson 6: Records & Audits.

- Different types of records needed for a comprehensive instrument management system.
- The role of audits to ensure your instrument management system is working.

Lesson 7: Calibration Software Considerations.

- Benefits of using instrument management software.
- Suggested selection criteria of software features for an instrument management software program.

Challenge: An assessment of the learner's progress in this unit.

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8D Problem-Solving Course Outline:

Unit 1 - Getting Started

Lesson 1: Becoming Aware of a Problem.

- Ways to recognize indications of problems.
- Ideas to help decide which problems to work on first.

Lesson 2: Why Use a Structured Problem-Solving Process?

- How a formal problem-solving approach can improve the effectiveness of the whole organization.
- Building a common problem-solving language.

Lesson 3: Do You Need a Team?

- Five questions to determine which problems need a team and which problems one person working alone can effectively handle.

Lesson 4: The Importance of Data.

- How data leads to information and information points the way to knowledge.
- Subjective versus objective data.
- Attribute data versus variable data.
- Using data to infer and make judgments.

Lesson 5: Overview of Different Problem-Solving Models.

- 8-Discipline Problem-Solving Model.
- DMAIC Project Cycle.
- Xerox Problem-Solving Process.
- Boeing Process Flow for Working Projects.
- A generic Six-Step Problem-Solving Model.

Challenge: An assessment of the learner's progress in this unit.

Unit 2 - 8-Discipline Process

Lesson 1: Use a Team Approach.

- Establishing team membership, roles of the members, boundaries of freedom for the team, and getting the team started up.

Lesson 2: Describe the Problem.

- Developing the Problem Statement.

Lesson 3: Interim Containment.

- Designing and putting temporary measures into place and verifying that they are working.

Lesson 4: Define the Root Causes.

- Using a systematic approach to collect, display, and analyze data to identify the root cause(s).
- Verifying that the cause identified is truly the root cause.

Lesson 5: Develop Solutions.

- Finding a solution to attack the root cause and correct the problem.
- Using mistake-proofing techniques.

Lesson 6: Implement the Solution.

Developing simple and complex action plans. Using Gantt and PERT Charts to plan the implementation and monitor progress.

Lesson 7: Prevent Recurrence.

- Finishing the job to ensure the problem does not come back.
- Ensuring training, audit practices, and knowledge transfer are completed.

Lesson 8: Congratulate the Team.

- Providing recognition for the problem-solving team.
- Ensuring the problem-solving team recognizes those that have assisted them.

Challenge: An assessment of the learner's progress in this unit.

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DMAIC Problem-Solving Course Outline:

Unit 1 - Getting Started

Lesson 1: Becoming Aware of a Problem.

- Ways to recognize indications of problems.
- Ideas to help decide which problems to work on first.

Lesson 2: Why Use a Structured Problem-Solving Process?

- How a formal problem-solving approach can improve the effectiveness of the whole organization.
- Building a common problem-solving language.

Lesson 3: Do You Need a Team?

- Five questions to determine which problems need a team and which problems one person working alone can effectively handle.

Lesson 4: The Importance of Data.

- How data leads to information and information points the way to knowledge.
- Subjective versus objective data.
- Attribute data versus variable data.
- Using data to infer and make judgments.

Lesson 5: Overview of Different Problem-Solving Models.

- 8-Discipline Problem-Solving Model.
- DMAIC Project Cycle.
- Xerox Problem-Solving Process.
- Boeing Process Flow for Working Projects.
- A generic Six-Step Problem-Solving Model.

Challenge: An assessment of the learner's progress in this unit.

Unit 2 - DMAIC Project Cycle

Lesson 1: Define.

- Establishing a project (problem-solving) team and getting the team started up.
- Developing the Problem Statement.

Lesson 2: Measure.

- Setting up the measurement systems so that the appropriate data needed to determine the root cause of the problem can be collected.

Lesson 3: Analyze.

- Using a systematic approach to collect, display, and analyze data to identify the root cause(s).
- Verifying that the cause identified is truly the root cause.
- Identifying a solution to attack the root cause and correct the problem.

Lesson 4: Improve.

- Executing the problem solution.
- Developing simple and complex action plans.
- Using Gantt and PERT Charts to plan the implementation and monitor progress.

Lesson 5: Control

- Finishing the job to ensure the problem does not come back.
- Ensuring training, audit practices, and knowledge transfer are completed.

Challenge: An assessment of the learner's progress in this unit.

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The Basics of DMAIC Course Outline:

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Unit 1 – The Basics of DMAIC

Lesson 1: Introduction

- To introduce learners to the concepts of the DMAIC process.
- To show how the DMAIC process relates to other problem solving processes.

Lesson 2: Define

- Establish a project (problem-solving) team and get the team started up.
- Develop the Problem Statement.

Lesson 3: Measure

- Set up measurement systems so that the appropriate data needed to determine the root cause of the problem can be collected.
- Assess measurement systems to make sure they are reliable.

Lesson 4: Analyze

- Use a systematic approach to collect, display, and analyze data to identify the root cause(s).
- Verify that the cause(s) identified is truly the root cause.
- Identify a solution to attack the root cause and correct the problem.

Lesson 5: Improve

- Execute the problem solution.
- Develop simple and complex action plans.
- Use Gantt Charts to plan the implementation and monitor progress.

Lesson 6: Control

- Ensure the solution is robust and well entrenched so that problem does not come back.
- Provide training and start audit practices to complete transfer of the solution to the process owners.

Challenge: An assessment of the learner's progress in this unit.

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FMEA Investigator Course Outline:

Unit 1: FMEA Overview

Lesson 1: Introduction.

- An overview of what an FMEA is; how the FMEA process works; and why an FMEA is used.

Lesson 2: Purpose of an FMEA.

- An explanation of how an FMEA helps identify risks, prioritizes the risks relative to one another, and focuses efforts on an action plan to reduce the risks.

Lesson 3: Tie to Quality Standards.

- An overview of the links between FMEAs and Quality Standards such as ISO 9000, QS-9000, & TS 16949.

Lesson 4: DFMEA or PFMEA?

- An explanation of the differences between a Design-FMEA and a Process-FMEA.

Lesson 5: The FMEA Process.

- A preview of the 10 steps used to conduct an FMEA. The same basic steps apply to both a DFMEA and a PFMEA.

Lesson 6: Assembling an FMEA Team.

- Helpful hints on assembling an effective FMEA team.

Challenge: An assessment of the learner's progress in this unit.

Unit 2: Design-FMEAs

Lesson 1: Design-FMEA Scope.

- How to clarify the scope for a DFMEA.
- Details on how to use the DFMEA Scope Worksheet.

Lesson 2: 10 Steps to Conduct a DFMEA.

- Step-by-step directions on conducting a DFMEA.
- Guidance on the use of the FMEA Analysis Worksheet.
- Techniques for customizing the Severity, Occurrence, and Detection Ranking Scales for a DFMEA.

Lesson 3: DFMEAs & Control Plans.

- Using the DFMEA Analysis to develop input for a Process Control Plan.

Lesson 4: Getting More Out of Your DFMEA.

- Tips on the best times in a product's life cycle to conduct a DFMEA.
- Tips on how to use the results of an FMEA to trigger continuous improvement.

Lesson 5: DFMEA Example.

- An example of the application of a DFMEA, working through all 10 steps.

Challenge: An assessment of the learner's progress in this unit.

Unit 3: Process-FMEAs

Lesson 1: Process-FMEA Scope.

- How to clarify the scope for a PFMEA.
- Details on how to use the PFMEA Scope Worksheet.

Lesson 2: 10 Steps to Conduct a PFMEA.

- Step-by-step directions on conducting a PFMEA.
- Guidance on the use of the FMEA Analysis Worksheet.
- Techniques for customizing the Severity, Occurrence, and Detection Ranking Scales for a PFMEA.

Lesson 3: PFMEAs & Control Plans.

- Using the PFMEA Analysis to develop a proactive Control Plan.

Lesson 4: Getting More Out of Your PFMEA.

- Tips on the best times and places to conduct a PFMEA.
- Tips on how to use the results of an FMEA to trigger continuous improvement.

Lesson 5: PFMEA Example.

- An example of the application of a PFMEA, working through all 10 steps.

Challenge: An assessment of the learner's progress in this unit.

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Mistake-Proof It! Course Outline:

Unit 1 - Mistake-Proofing Primer

Lesson 1: What is Mistake-Proofing?

- Rewriting Murphy's Laws.
- Exploring the source of mistakes.
- The mindset necessary for mistake-proofing.

Lesson 2: Mistake-Proofing in Everyday Life.

- Common examples of mistake-proofing all around us.
- Using these examples to trigger ideas at work.

Lesson 3: Why Errors Are Made.

- How process inputs create process outputs.
- Why the root causes of errors must be identified.

Lesson 4: Inspecting vs. Mistake-Proofing.

- The limitations of inspection.
- Why prevention is always more powerful than detection.

Lesson 5: How Mistake-Proofing Works.

- The language of mistake-proofing.
- The role of teams in mistake-proofing efforts.

Challenge: An assessment of the learner's progress in this unit.

Unit 2 - Effects of Mistake-Proofing

Lesson 1: Approaches to Mistake-Proofing.

- Exploring the 8 forms of mistake-proofing solutions.
- Guidelines for selecting a mistake-proofing approach.

Lesson 2: Forced Control Devices.

- Delving into the four families of devices and methods used to achieve a forced control effect.

Lesson 3: Shutdown Devices & Warning Alarms.

- Examining 10 common families of sensors used to achieve a shutdown effect.
- Investigating 4 families of audible alarms and 4 families of visual alarms used to achieve a warning effect.

Lesson 4: Sensory Alert Devices.

- A look at the use of color-coding, missing-in-action clues, and other aids to achieve a sensory alert effect.

Challenge: An assessment of the learner's progress in this unit.

Unit 3 - Implementing Mistake-Proofing Solutions

Lesson 1: Integrating Mistake-Proofing & Problem Solving.

- How to incorporate mistake-proofing solutions into common problem-solving processes.

Lesson 2: Practical, Feasible, & Cost Effective Solutions.

- Assessment techniques for determining the practicality, feasibility, and cost-effectiveness of your mistake-proofing solutions.

Lesson 3: How to Keep Solutions from Being Overridden.

- Tips for keeping your mistake-proofing solution from being ignored or disabled.

Lesson 4: How Robust is Your Solution?

- Assessment techniques for determining how robust your mistake-proofing solutions are.

Lesson 5: Complementary Tools.

- How to use ten continuous improvement tools to complement mistake-proofing efforts.

Challenge: An assessment of the learner's progress in this unit.

Unit 4 - Mistake-Proofing in Action

(Eight real-life examples in a variety of settings.)

Lesson 1: Mistake-Proofing in High Volume Manufacturing.

- Nowhere are the benefits of mistake-proofing more evident than in high volume operations.

Lesson 2: Mistake-Proofing in Assembly Operations.

- Mistake-proofing is a perfect tool to prevent assembly errors.

Lesson 3: Mistake-Proofing in a Job Shop Environment.

- Mistake-proofing in short-run job shops can make the difference between profitability and bankruptcy.

Lesson 4: Mistake-Proofing in Process Industries

- Mistake-proofing is at the core of complex chemical operations.

Lesson 5: Mistake-Proofing in Equipment Set-up.

- Mistake-proofing is an important element of set-up reduction.

Lesson 6: Mistake-Proofing in the Office.

- Mistake-proofing is not just for plant operations.

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Error-Proofing Business Processes Course Outline:

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Unit 1 - Error-Proofing Primer

Lesson 1: The Error-Proofing Mindset

- Understand the error-proofing mindset.
- Recognize that to error-proof a process or system the root cause of errors must be found and addressed.

Lesson 2: Error-Proofing in Everyday Life

- Be aware of examples of common error-proofing in action in everyday life.
- Understand that error-proofing does not require elaborate efforts or complex systems.

Lesson 3: Why Errors Are Made

- Realize that errors are usually due to process problems, not people problems.
- Become familiar with the transactional model of process and some of the complexities.

Lesson 4: How Transactions (Can) Go Wrong

- Understand some of the reasons transactional processes tend to be so complex.
- View errors by service providers into the categories of tasks, treatment and detractors/attractors and by customers into groupings of preparation, encounter and resolution.

Lesson 5: How Error-Proofing Works

- Become familiar with error-proofing effects, outcomes and solutions.
- Understand how error-proofing solutions are best developed in a team environment using a structured, data-driven problem-solving approach.

Challenge: An assessment of the learner's progress in this unit.

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Unit 2 - Error-Proofing Techniques

Lesson 1: Forms of Error-Proofing Solutions

- Know that error-proofing solutions are a combination of effects and outcomes.
- Be aware of common techniques to achieve each of the four types of effects.

Lesson 2: Developing Error-Proofing Solutions

- See how error-proofing solutions are best developed using a team problem-solving process.
- Be familiar with establishing team roles and responsibilities and how to clarify the problem.
- Understand how to focus on the root cause.
- Know how to formulate an error-proofing solution and develop an action plan to implement it.

Lesson 3: Evaluating Solutions

- Learn how to evaluate whether solution candidates are practical, feasible and cost-effective.
- Be able to evaluate the robustness of solution candidates.

Lesson 4: Error-Proofing and the Seven Wastes

- Recognize the Seven Wastes as chronic, hidden form of errors.
- Recognize the Seven Waste in terms of the Transactional Process Model with both server-side and customer-side causes.

Lesson 5: Complementary Error-Proofing Tools

- Learn how to apply the Five-Whys, Comparative Analysis, Timeline Analysis and Cause & Effect Diagrams as error-proofing investigative tools.
- Become familiar with how additive data picture tools help paint a picture of the problem.

Challenge: An assessment of the learner's progress in this unit.

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Root Cause Analysis with Corrective Action Course Outline:

Introduction Lesson: Root Cause Analysis Overview

- Overview of Root Cause Analysis
- Preview of Lessons 1 through 4.

Lesson 1: Form & Focus the Team

- Form a team: Not every problem needs to be solved by a team; individuals working alone can get to the bottom of many problems. However, sometimes problems involve so many people, are so critical, are so complex or have been around for so long that it makes sense to have a cross-functional team tackle them.
- Focus the team: A (formal) Problem Statement communicates the scope of the problem to be tackled and helps focus the root cause analysis effort.
- Understand the problem: Understanding the process and how it works (or flows) is important to understand the problem.

Lesson 2: Find the Root Cause

- Create a cause & effect diagram: Listing causes of the apparent problems and their resulting effects starts the path toward finding the root cause; grouping causes using a cause and effect diagram creates structure on the path to the root cause.
- Explore chains of causes: When one cause results in another, a chain of causes is started. When chains of causes are evident, it means the causes are related in some way. Chains of causes can be identified using the familiar Five-Whys technique. A chain of causes may lead right to the root cause.
- Study interrelationships: An Interrelationship Diagram can be used to show the relationships and natural links between different symptoms or causes of a complex problem to provide clues on which causes are the primary drivers of the problem.
- Use data analysis & investigative tools: To draw conclusions, data must be collected and analyzed. Visual displays of data often provide the most helpful clues. Investigative tools are used when conventional data display and data analysis tools have not yet pointed to the root cause. Investigative tools should provide a deeper understanding of how the process works.
- Identify root causes: When the root cause is found, always ask the root cause question: "Does this cause (or causes) explain all that we know about what the problem is, as well as all we know about what the problem isn't?"

Lesson 3: Fix the Root Cause

- Propose potential solutions.
- Select the "best" solution: Develop a criteria and an approach to be used to evaluate solution candidates against that criteria; use of Decision Matrices can aid decision-making.
- Conduct a reality test: Is the solution practical, feasible and cost-effective?
- Develop and implement the Action Plan.
- Verify that the solution works as designed and does not create new problems.

Lesson 4: Finalize the Solution

- Validate the solution: Check to make sure the desired outcomes have been realized.
- Update documentation: Update Quality Systems, Control Plans, related FMEAs and Operating Procedures.
- Train: If the solution has led to changes in procedures or systems have changed, those using the systems will need training on how to work with the changes
- Start audits: Audits help hold the gains.
- Transfer knowledge: Leverage successes by sharing and publicizing solutions.

Lesson 5: Overcoming Barriers

10 barriers to Root Causes Analysis with potential remedies:

1. The problem is poorly or incorrectly defined
2. A systematic approach is not used
3. Investigations are stopped prematurely
4. Decisions are based on guesses, hunches or assumptions
5. An inadequate level of detail is employed
6. Interim containment fixes are sometimes allowed to become "permanent"
7. The skills, knowledge and experience needed to uncover the root cause are not available
8. A lack of organizational will to tackle the "bigger" issues
9. Fear of being blamed
10. "I don't have the time"

Challenge: An assessment of the learner's progress in this unit.

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Fundamentals of APQP:

Lesson 0: Overview of APQP

- Explain the purpose of the APQP process.
- Describe the five phases of the APQP process.
- List the steps necessary to prepare for an APQP.

Lesson 1: Phase 1 – Plan and Define

- Describe the purpose and objectives of Phase 1.
- Understand how Phase 1 inputs set the stage for Phase 1 outputs.
- Explain how the outputs for one phase become the inputs for the next phase.
- Become familiar with the breadth and depth of Phase 1 outputs.

Lesson 2: Phase 2 – Product Design

- Describe the purpose and objectives of Phase 2.
- Understand how Phase 2 inputs set the stage for Phase 2 outputs.
- Become familiar with the breadth and depth of Phase 2 outputs.

Lesson 3: Phase 3 – Process Design and Development

- Describe the purpose and objectives of Phase 3.
- Understand how Phase 3 inputs set the stage for Phase 3 outputs.
- Become familiar with the breadth and depth of Phase 3 outputs.

Lesson 4: Phase 4 – Product and Process Validation

- Describe the purpose and objectives of Phase 4.
- Understand how Phase 4 inputs set the stage for Phase 4 outputs.
- Become familiar with the breadth and depth of Phase 4 outputs.

Lesson 5: Phase 5 – Feedback Assessment & Corrective Action

- Describe the purpose and objectives of Phase 5.
- Understand how Phase 5 inputs set the stage for Phase 5 outputs.
- Become familiar with the breadth and depth of Phase 5 outputs.

Lesson 6: Control Plans

- Explain the role of a control plan in the APQP process.
- Describe the key sections of a control plan.
- Distinguish between reaction plan triggers and root cause analysis.

Challenge: An assessment of the learner's progress in this unit.

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Six Sigma Start-Up (Six Sigma Overview) Course Outline:

Section 1 - Six Sigma Environment

Philosophy

- Improve Profitability
- Be Customer Focused
- Measure Outcomes
- Focus on Prevention
- Reduce Variation

Key Concepts

- Use Data
- Track DPMOs
- Understand COQ
- Focus on CTQ Elements
- Use Facilitation as Applied Training
- Assure an Acceptable ROI is Achieved
- Link Performance & Rewards

Section 2 - Six Sigma Tools

Statistical Tools

- SPC
- Process Capability
- Measurement System Analysis
- Statistical Analysis
- Design of Experiments

Process Mapping Tools

- Flowcharts
- Workflow Diagrams
- Brown Paper Flows

Data Display Tools

- Pie Chart
- Bar Graph
- Histogram
- Pareto Analysis
- Scatter Diagram
- Trend Chart
- Concentration Diagram

Problem-Solving Tools

- Team Problem-Solving Process
- Cause & Effect Diagram
- Brainstorming
- PERT Chart
- Gantt Chart

Root Cause Analysis Tools

- 5-Whys
- What Is-What Isn't Analysis
- Timeline Analysis
- Fault Tree Analysis

Process Improvement Tools

- Failure Mode and Effects Analysis (FMEA)
- Mistake-Proofing (Poka Yoke Techniques)
- 5Ss: Workplace Organization
- Total Productive Maintenance (TPM)
- Set-up Reduction (SMED)

Product-Process Interaction Tools

- Quality Function Deployment QFD)
- DFX (Design for Assembly/Manufacturability/Environment)
- Failure Mode & Effects Analysis (FMEA)
- Design of Experiments (DOE)

Decision-Making Aides

- Test of Significance
- Musts & Wants
- Nominal Group Technique and Voting & Ranking

Lean Thinking Tools

- Workflow Analysis
- One-Piece Flow
- Kanbans
- TAKT Time
- Set-up Reduction

Section 3 - Six Sigma Infrastructure

Organization

- Leadership Team
- Mentors & Coaches
- Black Belts
- Teams & Projects
- DMAIC vs. DMADV Models
- Roll-Out

Support System

- Boundaries of Freedom
- Best Practices Forum
- Teamwork & Conflict Resolution
- Visual Factory
- Recognition

Managing Projects

- Sources of Project Identification
- Project Selection
- Project Reviews
- Project Solutions

Training Model

- Basic, Intermediate, & Advanced Tools
- Training Methods
- Training Plan
- Facilitation
- Resources

Metrics

- DPMOs
- Baseline & Trends
- Balanced Scorecard
- Benchmarks

Performance and Rewards

- Recognition vs. Rewards
- Compensation & Performance

Challenge – An assessment of the learner's progress

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Lean Manufacturing Course Outline:

Unit 1 - Lean Concepts

Lesson 1: Why Lean?

- Be customer focused: Be on-time, responsive, flexible, and fast.
- Simplify and standardize workflows: Mimic continuous flow, minimize WIP, use visible measures.
- Manage capacity: Increase process uptime, reduce set-up times, find "lost" capacity.
- Eliminate waste: Identify non-value adding activities, then modify, combine, or eliminate those tasks.
- JIT: Not too early and never late; not just-in-case inventory but just-in time production and delivery; products must always be made right the first time; equipment must always work when needed.

Lesson 2: Lean Terminology

- Terms
- Tools
- Techniques

Lesson 3: Eliminate Waste with Lean

- Match lot sizes to customer demands: Use kanbans; end WIP.
- Use pull scheduling instead of push scheduling.
- Schedule to the rate-determining step (the bottleneck), then debottleneck process lines.
- Facilitate fast feedback: Arrange sequential operations next to each other ensures fast feedback from internal customer operation to internal supplier operation if something in-process is not right.

Lesson 4: Components of Lean

- Overview of the 8 Components of Lean: Value Stream Mapping, Workplace Organization, Predictability & Consistency, Set-up Reduction, TPM, Visual Factory, Support Processes, & Continuous Improvement.

Lesson 5: Value Stream Analysis

- Mapping the process from incoming order to outgoing product: Define process goals, create the current state map, & establish process metrics.
- Using the current state map to identify potential improvements, conceive the future state.

Lesson 6: Lean Thinking

- Eliminating waste is not limited to manufacturing; the same techniques apply to the office, sales, finance, maintenance, and even R&D processes and procedures.
- Lean & Six Sigma are complementary.

Challenge: An assessment of the learner's progress in this unit.

Unit 2 - Lean Practices

Lesson 1: Value Stream Mapping.

- Identify process goals.
- Collect & analyze process data.
- Create a macro-facility workflow to determine how to minimize high volume travel distances.
- Conduct a micro-process workflow to apply cellular concepts, identify and remove bottlenecks, & move to pull manufacturing with kanbans.

Lesson 2: Workplace Organization

- Apply the 5S's: Sort (clearing the work area), Set in Order (designating locations), Shine (cleanliness and workplace appearance), Standardize (everyone doing things the same way), & Sustain (ingraining it in the culture).

Lesson 3: Predictability & Consistency.

- Use DFA/DFM to design quality in.
- Conduct GR&Rs to ensure reliable measurement systems are in place.
- Employ SPC to help ensure processes are predictable & stable.
- Reduce variation, & improve process capability with DOE.
- Eliminate the root cause of defects using problem-solving and mistake-proofing.
- Move to Six Sigma quality.

Lesson 4: Set-up Reduction

- Apply SMED concepts.
- Separate external tasks (external to the process) from internal tasks.

Lesson 5: TPM

- TPM versus PM.
- Develop operator involvement in the equipment and begin predictive maintenance practices.

Lesson 6: Visual Factory

- Use status display of performance for dashboard or balanced measures/COQ results.
- Visual controls such as sensory alerts indicate if something is out of place.
- Marking on the floor, kanbans, andons, & panel-alarms all help build a visual control infrastructure.

Lesson 7: Support Processes

- Lean techniques require changes in Purchasing, Scheduling, Warehousing/Shipping, & Accounting practices.

Lesson 8: Continuous Improvement

- Fight NIH (not-invented-here) attitudes and leveraging successes.
- Use kaizen events for rapid, targeted improvements to achieve the future state.
- Use a standardized Problem-Solving Model (e.g. DMAIC or 8-D).
- Begin an employee idea system.

Challenge: An assessment of the learner's progress in this unit.

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Lean Manufacturing Course Outline (Continued):

Unit 3 – Lean Implementation

Lesson 1: Lean Starts with People

- Communicate the why, what, how, & who.
- Provide education in the concepts.
- Train employees in tools & techniques as needed to achieve a flexible workforce.

Lesson 2: Data Drives Lean

- Focus efforts on projects that lead to tangible saving.
- Calculation techniques to generate data include: Time studies, equipment loading, TAKT time, staffing requirements, process yields, & COQ.
- Sample Worksheets covered include: Lean Project Summary; Cell Target Worksheet; Data Collection Form for Basic Equipment and Utility Parameters; Value-adding Analysis Worksheet; Process Change-Over/Setup Worksheet; Set-Up Reduction Worksheet; Cubic Feet Analysis Worksheet; & Lot Size Worksheet.

Lesson 3: Layout Options

- Improved layout are about moving cubic feet (not numbers of items), eliminating crossover points, arranging the process in the natural flow order; linking processes to minimize time and distance; moving equipment together to simulate a continuous process flow; & putting internal customers and suppliers next to each other.
- Be careful to identify anchors or monuments; do not move them.
- Typical layout options are explored.

Lesson 4: Lean Inventory Practices

- Minimize trips to and from the warehouse by designing the warehouse to work for you.
- Use ABC inventory categories to prioritize inventory needs and storage locations.

Lesson 5: Roadmap for Lean

- Start with the people issues.
- Focus on workplace organization (the 5S's), then, use value stream analysis and process workflow analysis to establish effective layouts.
- Where to focus next depends on specific needs.
- Use targeted Kaizen events to speed changes.
- Do not overlook the need to modify support processes (especially scheduling and purchasing).

Lesson 6: Pitfalls with Lean

- Not documenting the financial impact/savings.
- Lack of commitment from leadership.
- Using traditional purchasing practices.
- Not changing scheduling techniques.
- Failure to address workforce issues.
- Not really mistake-proofing the root cause.
- Thinking Lean is just for manufacturing.
- Not using beneficial technology.
- Not leveraging successes.
- Getting too lean.
- Failing to hold the gains.

Challenge: An assessment of the learner's progress in this unit.

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Lean for Business Processes Course Outline:

Lesson 1: Tackling Waste

- Identify the seven wastes.
- Explain value-adding versus non-value adding.
- Define value from customer's perspectives.
- Briefly describe how each of the seven wastes detracts value from a process.

Lesson 2: Process Mapping

- Define the bounds of a workflow.
- Use a variety of process (workflow) mapping techniques.
- Identify hand-offs, disconnects, incomplete communication and rework loops as non-value-adding components (or waste.)
- Plan improvements to workflows.
- Consider a move from batch processing to continuous (or one-piece) flow.

Lesson 3: Streamline the Process

- Know what Takt Time means.
- Identify process bottlenecks.
- Calculate Process Cycle Efficiency.
- Understand how to balance workloads within a process workflow.
- Calculate First Pass Yield.
- Be familiar with workflow and work station layout considerations.

Lesson 4: 5S's in the Office

- Identify each of the 5S's.
- Know how to clear clutter from a work area.
- Explain the rationale for selecting effective designated storage locations.
- Understand how to maintain the work area's appearance and use preventive measures to keep it clean.
- Describe what it means to standardize and why standardization is important.
- Know how to use audits to sustain workplace organization and to prevent backsliding.

Lesson 5: Error-Proofing Overview

- Understand the error-proofing mindset.
- Be aware of common error-proofing techniques.
- Comprehend the Transaction Model (consisting of the server-side and customer-side.)
- Know how to use basic root cause analysis tools.

Lesson 6: TPM for Business Processes

- Be aware of TPM's impact on the Seven Wastes.
- Recognize TPM's influence on reliability and uptime of business process support systems.
- Begin measuring Overall Equipment Effectiveness.

Lesson 7: Lean Business Process Measures

- Measure Lean efforts by tracking Process Cycle Efficiency trends.
- Create a Balanced Scorecard to track waste reduction.
- Audit 5S activities to maintain workplace organization momentum.
- Monitor uptime, throughput rates and yields using Overall Equipment Effectiveness.
- Develop two-dimensional surveys to gather meaningful customer feedback.

Challenge: An assessment of the learner's progress in this unit.

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The 5S's: Workplace Organization Course Outline:

Unit 1 - 5S's Step-by-Step

Lesson 1: What is 5S All About?

- An overview of the 5S's is presented.
- The benefits and operational impact of implementing the 5S's are discussed.

Lesson 2: Sort: Clearing the Work Area

- How to organize the work area for efficiency & effectiveness and use the "48-Hour Rule."
- A stepwise approach to clear the work area is presented.

Lesson 3: Set in Order: Designated Locations

- How to designate "a place for everything & ensure everything is in its place."
- Considerations for establishing locations for storing items including: storage rational, storage options, location-specific tips, storage don'ts, using signs & labels, & documenting the plan are all covered.

Lesson 4: Shine: Cleanliness & Workplace Appearance

- The three aspects of Shine (getting the workplace clean, maintaining its appearance, and using preventive measures to keep it clean) are explored.

Lesson 5: Standardize: Everyone Doing Things the Same Way

- How to design systems that help ensure that everyone does thing the same way.

Lesson 6: Sustain: Ingrain It in the Culture

- Sustain is perhaps the toughest of the 5S's. Techniques to prevent backsliding are presented.

Challenge: An assessment of the learner's progress in this unit.

Unit 2 - 5S Implementation

Lesson 1: An Organization-Wide 5S Effort

- How to plan and implement a 5S initiative.
- An 8-point roadmap for the 5S's: 1: Leadership Team; 2: Infrastructure, 3: Communications; 4: Training; 5: 5S Pilots; 6: Best Practices; 7: Full Roll-Out Plan; 8: Evaluate & Adjust.

Lesson 2: Tackling 5S's on Your Own

- How to implement the 5S's in a work area if an organization-wide initiative is not supported.

Lesson 3: Success Stories: Sorts

- Examples of "Sort Successes" showing both the before state and the after state with the impact (savings) explained.
- Checklist to help achieve successful Sorts.

Lesson 4: Success Stories: Set in Order

- Examples of "Set in Order Successes" showing both the before state and the after state complete with the impact on the organization.
- Set in Order Checklists.

Lesson 5: Success Stories: Shine, Standardize, & Sustain

- Examples of successful approaches for the Shine, Standardize, & Sustain phases of a 5S program.

Challenge: An assessment of the learner's progress in this unit.

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Gage Mentor (Dimensional Gages) Course Outline:

Unit 1 - Gage Primer

Lesson 1: Why Measure?

- The importance of measuring in today's manufacturing world.
- The 5 critical aspects of measuring.

Lesson 2: Language of Measurement

- Key terms you need to know in order to speak the language of dimensional metrology.

Lesson 3: Measurement Standards

- The role of standards.
- Types of standards related to dimensional metrology including units of measure, dimensioning & tolerancing practices, laboratory practices, calibration standards, and documentation.

Lesson 4: Precision & Accuracy

- Key measurement concepts that serve as the foundation of a good measurement system.
- The 5 components of any measurement system.
- How variation in any component can lead to measurement error.

Lesson 5: Datums

- How measurements are referenced by design and manufacturing engineers on drawings.
- Datums, datum feature symbols, datum features, simulated datums, and target datums.
- The use of primary, secondary, and tertiary datums.

Lesson 6: Introduction to GD&T

- Comparison of coordinate tolerancing and GD&T techniques.
- How to read drawing symbols used with GD&T.
- The 14 GD&T geometric characteristics.
- The use of modifiers.

Lesson 7: Surface Finishes

- An overview of measurements used to characterize the finish of a surface.
- How to interpret lay and surface symbols.

Lesson 8: Math for Measuring

- A basic review of simple mathematical concepts such as converting fractions and working with decimals.
- Basic geometry concepts.

Challenge: An assessment of the learner's progress in this unit.

Unit 2 - Using Gages

Lesson 1: Types of Gages

- A review of universal dimensional measurement techniques.
- An introduction of the gages to be explored in this Unit.
- A brief overview of specialty measurement devices.

Lesson 2: Calipers

- How to use and read vernier scales.
- How to use a caliper.
- The pros and cons of vernier scale, dial, and digital calipers.

Lesson 3: Micrometers

- The size vs. range of a micrometer.
- How to read micrometer scales.
- How to use outside and inside micrometers.
- Discrimination vs. accuracy of digital micrometers.

Lesson 4: Height & Depth Gages

- How to use a height gage for direct and comparative height measurements.
- How gage blocks and height masters are used with height gages.
- Potential problems with height gages.
- How to use depth gages.
- Potential problems with depth gages.

Lesson 5: Fixed Gages

- Explanations of the different types of fixed limit and GO/NOGO gages.
- Advantages and disadvantages of fixed gages and variable gages.
- Hints for using each type of fixed gage covered.

Lesson 6: Test Indicators & Dial Indicator

- The differences between the features and capabilities of test indicators and dial indicators.
- How to use test indicators with adjustable arm test sets for comparative length measurements.
- How to use dial indicators with comparator stands for comparative length measurements.
- Potential problems with indicators.

Lesson 7: Gage Blocks & Surface Plates

- Gage block and surface plate standards and grades.
- The use of gage blocks and surface plates.
- How to wring gage blocks.
- How to calculate combination stacks of gage blocks.
- Basic care points for gage blocks and surface plates.

Challenge: An assessment of the learner's progress in this unit.

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Gage Mentor Course Outline (Continued):

Unit 3 - Gaging Applications

Lesson 1: Application Overview.

- An overview of the dimensional measuring applications covered.

Lesson 2: Linear Measurements

- An exploration of which linear gage to use for a wide spectrum of specific measuring applications.
- Exercises looking at which gages are acceptable (and unacceptable) to use for measuring part features such as OD, ID, slot width, slot depth, differential height, and hole position.

Lesson 3: Roundness & Circularity

- How to take out-of-roundness measurements.
- Problems with measuring roundness and the OD with two-point contact gages.
- How to gage the effective diameter.
- How to select and use three-point contact devices for roundness and OD measurements.
- How to measure cylindricity.

Lesson 4: Common Misapplications

- 12 common measuring mistakes and misapplications.
- What to look out for and how to prevent these mistakes from happening.

Lesson 5: Measuring Complications

- 10 systemic problems that can lead to measuring complications.
- An exploration of why each complication may occur with suggested remedies to combat it and make the measurement system more robust.

Lesson 6: Care of Gages

- Universal care points that apply to all gages and instruments.
- Specific hints to ensure the proper care of specific gage families including surface plates, gage blocks, micrometers, calipers, height and depth gages, fixed gages, and indicators..

Challenge: An assessment of the learner's progress in this unit.

Targeted Training Topics: Short(er) courses priced at ½ the cost of our Master Courses. Not all TTC's are available to individual learners.

Advanced Control Charts

Lesson 1: Setting Up Variable Control Charts

- Five steps for setting up baseline variable control charts.
- Interpreting the control chart.
- Taking action to improve the process.

Lesson 2: Setting Up Attribute Control Charts

- Setting up p, np, c, and u charts.
- Interpreting the control chart.
- Taking action to improve the process.

Lesson 3: More Patterns of Instability

- The 4 common Western Electric tests of instability.
- The 14 "Other (Western Electric) Unnatural Patterns of Variation."
- Comparisons of Western Electric, AIAG, Nelson, & Boeing rules of instability

Lesson 4: Setting Up Individuals & Moving Range Control Charts

- Calculating control limits and establishing a baseline chart for IX & MR Charts.

Lesson 5: Special Control Charts & Applications

- Variations on the standard variable data control charts.
- Four variations of the R Chart.
- Five variations of the x-bar Chart.
- Twelve common control chart formats.

Advanced Process Capability

Lesson 1: Conducting a Process Capability Study

- How-to conduct a process capability study.

Lesson 2: Taking Action to Improve the Process

- What to do if the process is not capable.

Lesson 3: More Capability Indices

- Pp & Ppk.
- Differences between Ppk & Cpk.
- Cpm & Ppm.

Lesson 4: Process Capability Study Complications

- Using individuals instead of subgroups.
- Compensating for tool wear.
- Skewed Distribution.
- One-sided specs.
- Short Run processes.

Lesson 5: Six Sigma Capability

- Explanation of Six Sigma quality.
- How to use Z-values.

Control Chart Basics

Lesson 1: What are Control Charts?

- What control charts are and why they are used.

Lesson 2: What a Control Chart Looks Like

- Common elements of all control charts.

Lesson 3: Interpreting Control Charts & Taking Action

- Out-of-control patterns and what to do when they occur.

Lesson 4: Types of Control Charts

- Variable and attribute control charts: Which do you use when?

Lesson 5: Using Variable Control Charts

- Calculating and plotting data and interpreting variable-data charts.

Lesson 6: Using Attribute Control Charts

- Calculating and plotting data and interpreting attribute-data charts.

Introduction to Lean Six Sigma

Course Objectives:

- Understand the scope and breadth of a Lean Six Sigma initiative.
- Gain an understanding of what waste is and how to identify it so that it can be reduced.
- Become aware of variation and techniques to reduce it.
- Become familiar with the DMAIC team project model.
- Be aware of the infrastructure needed to support a Lean Six Sigma effort.

Introduction to Six Sigma

Lesson 1: The Environment

- Understand basic Six Sigma philosophy such as the focus on value-adding, being customer-driven, measuring outcomes and reduction in variation.
- Become aware of key Six Sigma concepts such as action-orientation, DPMOs, COQ, CTC and CTQ.
- Recognize the role of the Leadership Team in building a Six Sigma environment.

Lesson 2: The Tools

- Be exposed to major families of Six Sigma tools.
- Become aware of the scope of data collection/display/analysis tools available use to find, solve and prevent problems.

Lesson 3: The Infrastructure

- Understand the need for a solid infrastructure to ensure a lasting Six Sigma initiative.
- Explore the organization, support systems, project management components, training, metrics and recognition/rewards needed for a comprehensive Six Sigma infrastructure.

Introduction to the 5S's

Lesson 1: What is 5S All About?

- An overview of the 5S's is presented.
- The benefits and operational impact of implementing the 5S's are discussed.

Lesson 2: An Organization-Wide 5S Effort

- How to plan and implement a 5S initiative.
- An 8-point roadmap for the 5S's: 1: Leadership Team; 2: Infrastructure, 3: Communications; 4: Training; 5: 5S Pilots; 6: Best Practices; 7: Full Roll-Out Plan; 8: Evaluate & Adjust.

Lean Implementation

Lesson 1: Roadmap for Lean

- Start with the people issues.
- Focus on workplace organization (the 5S's), then, use value stream analysis and process workflow analysis to establish effective layouts.
- Where to focus next depends on specific needs.
- Use targeted Kaizen events to speed changes.
- Do not overlook the need to modify support processes (especially scheduling and purchasing).

Lesson 2: Lean Leadership

- Communicate the why, what, how, & who.
- Provide education in the concepts.
- Train employees in tools & techniques as needed to achieve a flexible workforce.

Lesson 3: Pitfalls with Lean

- Not documenting the financial impact/savings.
- Lack of commitment from leadership.
- Using traditional purchasing practices.
- Not changing scheduling techniques.
- Failure to address workforce issues.
- Not really mistake-proofing the root cause.
- Thinking Lean is just for manufacturing.
- Not using beneficial technology.

- Not leveraging successes.
- Getting too lean.
- Failing to hold the gains.

Lean Process Layouts (Micro-Mapping)

Lesson 1: Data Drives Lean

- Focus efforts on projects that lead to tangible saving.
- Calculation techniques to generate data include: Time studies, equipment loading, TAKT time, staffing requirements, process yields, & COQ.
- Sample Worksheets covered include: Lean Project Summary; Cell Target Worksheet; Data Collection Form for Basic Equipment and Utility Parameters; Value-adding Analysis Worksheet; Process Change-Over/Setup Worksheet; Set-Up Reduction Worksheet; Cubic Feet Analysis Worksheet; & Lot Size Worksheet.

Lesson 2: Layout Options

- Improved layout are about moving cubic feet (not numbers of items), eliminating crossover points, arranging the process in the natural flow order; linking processes to minimize time and distance; moving equipment together to simulate a continuous process flow; & putting internal customers and suppliers next to each other.
- Be careful to identify anchors or monuments; do not move them.
- Typical layout options are explored.

Lean Support Processes

Lesson 1: Support Processes

- Lean techniques require changes in Purchasing, Scheduling, Warehousing/Shipping, & Accounting practices.

Lesson 2: Lean Starts with People

- Communicate the why, what, how, & who.
- Provide education in the concepts.
- Train employees in tools & techniques as needed to achieve a flexible workforce.

Mapping Office Workflows

Course Objectives:

- Define the bounds of a workflow.
- Use a variety of process (workflow) mapping techniques.
- Identify hand-offs, disconnects, incomplete communication and rework loops as non-value-adding components (or waste.)
- Plan improvements to workflows.
- Consider a move from batch processing to continuous (or one-piece) flow.

Overview of APQP

Course Objectives:

- Explain the purpose of the APQP process.
- Describe the five phases of the APQP process.
- List the steps necessary to prepare for an APQP.

Overview of Lean

Lesson 1: Why Lean?

- Be customer focused: Be on-time, responsive, flexible, and fast.
- Simplify and standardize workflows: Mimic continuous flow, minimize WIP, use visible measures.
- Manage capacity: Increase process uptime, reduce set-up times, find "lost" capacity.
- Eliminate waste: Identify non-value adding activities, then modify, combine, or eliminate those tasks.
- JIT: Not too early and never late; not just-in-case inventory but just-in time production and delivery; products must always be made right the first time; equipment must always work when needed.

Lesson 2: Eliminate Waste with Lean

- Match lot sizes to customer demands: Use kanbans; end WIP.
- Use pull scheduling instead of push scheduling.
- Schedule to the rate-determining step (the bottleneck., then debottleneck process lines.
- Facilitate fast feedback: Arrange sequential operations next to each other ensures fast feedback from internal customer operation to internal supplier operation if something in-process is not right.

Lesson 3: Components of Lean

- Overview of the 8 Components of Lean: Value Stream Mapping, Workplace Organization, Predictability & Consistency, Set-up Reduction, TPM, Visual Factory, Support Processes, & Continuous Improvement.

Overview of Root Cause Analysis

Course Objectives:

- Understand the importance of getting to the root cause of a problem to assure that it is eliminated for good.
- Recognize common barriers to root cause analysis and apply techniques to overcome those barriers.

Process Capability Basics

Lesson 1: What is Process Capability?

- What process capability means and why it is important.

Lesson 2: Measuring Process Capability

- The capability ratio, process capability index, and Cpk.
- Process performance indices, Ppk and Pp.
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Role of a (Lean Six Sigma) Champion

Lesson 1: What Does a Champion Do?

- Conduct a self-assessment to determine if you are a good candidate to fill the role of a champion.
- Explore the six basic roles of a champion.
- Gain an understanding of how to fulfill basic champion roles.

Lesson 2: Support Systems for Champions

- Examine a typical supporting infrastructure for champions.
- Consider forms and checklists used to formalize support systems.

Lesson 3: Pitfalls to Avoid

- Investigate seven of the most common pitfalls champions must deal with.
- Explore remedies to the pitfalls.

The Lean Mindset

Lesson 1: Why Lean?

- Be customer focused: Be on-time, responsive, flexible, and fast.
- Simplify and standardize workflows: Mimic continuous flow, minimize WIP, use visible measures.
- Manage capacity: Increase process uptime, reduce set-up times, find "lost" capacity.
- Eliminate waste: Identify non-value adding activities, then modify, combine, or eliminate those tasks.
- JIT: Not too early and never late; not just-in-case inventory but just-in time production and delivery; products must always be made right the first time; equipment must always work when needed.

Lesson 2: Lean Terminology

- Terms
- Tools
- Techniques

Lesson 3: Value Stream Mapping

- Identify process goals.
- Collect & analyze process data.
- Create a macro-facility workflow to determine how to minimize high volume travel distances.
- Conduct a micro-process workflow to apply cellular concepts, identify and remove bottlenecks, & move to pull manufacturing with kanbans.

Lesson 4: Continuous Improvement

- Fight NIH (not-invented-here) attitudes and leveraging successes.
- Use kaizen events for rapid, targeted improvements to achieve the future state.
- Use a standardized Problem-Solving Model (e.g. DMAIC or 8-D).
- Begin as employee idea system.

Understanding Variation

Lesson 1: Introduction to Variation

- Explain what "variation" in work processes is.
- Describe the problem with variation in work processes.
- Identify sources of variation in work processes.
- Explain how SPC can be used to reduce variation.

Lesson 2: Measuring Variation

- Set up a histogram and plot data on it.
- Identify a histogram displaying normal variation.
- Select from several normal distributions the process with the least variation.
- Explain what an outlier is and what outliers tell us about our process.

Lesson 3: Patterns of Variation

- Identify a bimodal distribution and list three possible causes for that pattern of variation.
- Identify a skewed distribution and list three possible causes for that pattern.

Lesson 4: Measures of Variation

- Explain when you should use a simple random sample vs. a stratified sample.
- Define the terms mean, range, and standard deviation and explain how each is calculated.
- Explain the shortcoming of using the mean and range as a measure of variation.

Lesson 5: The Normal Curve

- Describe the properties of a normal curve.
- Describe what is meant by the 68, 95, and 99.7% rule.
- Given a process with a normal distribution, and given the process mean and standard deviation, explain where 68%, 95%, and 99.7% of the data for the process will fall.

Lesson 6: Stability

- Define what is meant by a stable process.
- Describe what factors in your work environment can make your process unstable.
- Explain what is meant by over-adjustment and describe the ramifications of over-adjustment.

Value Stream (Macro-Mapping)

Lesson 1: Value Stream Analysis

- Mapping the process from incoming order to outgoing product: Define process goals, create the current state map, & establish process metrics.
- Using the current state map to identify potential improvements, conceive the future state.

Lesson 2: Streamlining the Value Stream

- Identify process goals.
- Collect & analyze process data.
- Create a macro-facility workflow to determine how to minimize high volume travel distances.
- Conduct a micro-process workflow to apply cellular concepts, identify and remove bottlenecks, & move to pull manufacturing with kanbans.