Advanced Statistical Quality Control in Manufacturing Training Course

Professional Development Training Course Outline

Category	Manufacturing	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Advanced Statistical Quality Control (ASQC) in Manufacturing is a critical discipline that enables organizations to achieve zero-defect production, reduce process variation, and enhance overall operational efficiency. In today's Industry 4.0 environment, manufacturers are increasingly integrating statistical process control (SPC), predictive analytics, Six Sigma methodologies, and AI-driven quality systems to ensure consistent product quality and regulatory compliance. Advanced Statistical Quality Control in Manufacturing Training Course is designed to equip professionals with advanced tools and techniques to monitor, analyze, and improve manufacturing processes using robust statistical methods.

The course bridges traditional quality engineering with modern data-driven manufacturing practices, including machine learning for defect prediction, real-time quality monitoring, control charts optimization, process capability analysis (Cp/Cpk), and lean manufacturing integration. Participants will gain hands-on expertise in transforming raw production data into actionable insights that drive continuous improvement, cost reduction, and customer satisfaction in highly competitive industrial environments.

Programme Curriculum

Advanced Statistical Quality Control in Manufacturing Training Course

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Course Objectives

1. Master Statistical Process Control (SPC) techniques for real-time manufacturing monitoring
2. Apply advanced Six Sigma DMAIC methodology for defect reduction
3. Analyze process variation using Cp, Cpk, Pp, Ppk indices
4. Implement control charts (X-bar, R, S, EWMA, CUSUM) effectively
5. Develop capability in predictive quality analytics and forecasting models
6. Use AI-driven quality inspection systems for defect detection
7. Integrate Lean Manufacturing with statistical quality tools
8. Perform root cause analysis (RCA) using statistical methods
9. Optimize production using design of experiments (DOE)
10. Enhance decision-making through data-driven quality dashboards
11. Apply multivariate statistical analysis in manufacturing processes
12. Reduce variability using process optimization techniques
13. Build competency in Industry 4.0 smart manufacturing quality systems

Target Audience

1. Quality Control Engineers
2. Manufacturing Process Engineers
3. Production Supervisors & Managers
4. Six Sigma Green/Black Belts
5. Industrial Engineers
6. Data Analysts in Manufacturing
7. Operations Excellence Professionals
8. Continuous Improvement Specialists

Course Modules

Module 1: Fundamentals of Statistical Quality Control

- Basics of quality management systems
- Types of quality variation (common & special causes)
- Role of statistics in manufacturing
- Introduction to SPC concepts
- Case Study: Defect reduction in automotive assembly line

Module 2: Probability & Statistical Foundations

- Probability distributions in manufacturing

- Normal distribution applications
- Sampling techniques
- Hypothesis testing basics
- Case Study: Sampling error reduction in packaging industry

Module 3: Control Charts (Classical SPC)

- X-bar and R charts
- P and NP charts
- C and U charts
- Chart interpretation techniques
- Case Study: Real-time defect tracking in electronics production

Module 4: Advanced Control Charts

- EWMA charts
- CUSUM charts
- Adaptive control charts
- Detection of small shifts
- Case Study: Pharmaceutical batch quality monitoring

Module 5: Process Capability Analysis

- Cp, Cpk, Pp, Ppk metrics
- Capability vs performance
- Process centering and spread
- Specification limits analysis
- Case Study: Injection molding process optimization

Module 6: Measurement System Analysis (MSA)

- Gauge R&R studies
- Bias, linearity, stability
- Measurement error reduction
- Calibration systems
- Case Study: Automotive sensor calibration system

Module 7: Six Sigma Methodology (DMAIC)

- Define, Measure, Analyze, Improve, Control
- DMAIC tools integration
- Critical-to-quality (CTQ) identification
- Process mapping
- Case Study: Lean Six Sigma in steel manufacturing

Module 8: Design of Experiments (DOE)

- Full and fractional factorial designs
- Taguchi methods
- Response surface methodology
- Factor interaction analysis
- Case Study: Optimizing welding parameters

Module 9: Regression & Predictive Modeling

- Linear & multiple regression
- Correlation analysis
- Predictive quality modeling
- Residual diagnostics
- Case Study: Predicting defect rates in textile production

Module 10: Multivariate Quality Analysis

- Principal component analysis (PCA)
- Cluster analysis
- Factor analysis
- High-dimensional data interpretation
- Case Study: Semiconductor manufacturing defect clustering

Module 11: Root Cause Analysis (RCA)

- Fishbone diagram (Ishikawa)
- 5 Whys technique
- Pareto analysis
- Statistical RCA tools
- Case Study: Assembly line downtime reduction

Module 12: Lean Manufacturing Integration

- Waste identification (Muda, Mura, Muri)
- Value stream mapping
- Just-in-time quality control
- Continuous flow optimization
- Case Study: Lean transformation in FMCG plant

Module 13: AI & Machine Learning in Quality Control

- Machine learning basics for QC
- Predictive defect detection
- Image recognition for inspection
- Anomaly detection systems
- Case Study: AI-based visual inspection in electronics

Module 14: Real-Time Quality Monitoring Systems

- IoT-based sensors in manufacturing
- Digital dashboards
- Real-time SPC systems
- Cloud-based quality analytics
- Case Study: Smart factory implementation

Module 15: Industry 4.0 Smart Quality Systems

- Cyber-physical systems
- Digital twin in manufacturing

- Automation in quality assurance
- Big data analytics integration
- Case Study: Fully automated automotive plant quality system

Training Methodology

This course employs a participatory and hands-on approach to ensure practical learning, including:

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

Ready to enroll or request a customized program? Book online or contact us:

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