Six Sigma Black Belt Training/Certification

(Note: This format is only a guideline. The training can be customized to your needs and requirements)

Training Provided by: Prof. Amar Sahay, Ph.D.

B.S. Production Engineering (India)
M.S. Industrial Engineering (USA)
Ph.D. Mechanical Engineering (USA)
(Ph.D. emphasis in Manufacturing Systems, CAD/CAM and Quality Engineering)
Senior Members of Institute of Industrial Engineers, USA; Society of Manufacturing Engineering (USA), American Society for Quality (ASQ, USA)
Member of NAFSA (Association of International Educators, USA)
Member of AEA (American Education Evaluation Association)
Full time faculty, over 15 years of teaching, training, research and consulting experience
Author of 3 books in Six Sigma; more than 30 articles/research papers in national and international journals and conference proceedings

---

Prerequisite:	A course in Statistics/Data Analysis
Software:	MINITAB Statistical Software, Release 15/16 MINITAB Quality Companion (recommended)

Training Material

Text : Six Sigma Quality using MINITAB-Statistical Tools in Six Sigma DMAIC Process, Volume 1 and 2 by Amar Sahay, Ph.D.

1. Six Sigma Quality using MINITAB: Statistical Tools in Six Sigma DMAIC Process: Volume I

The book contains:

- The fundamentals of Six Sigma, Lean Six Sigma, Design for Six Sigma (DFSS)
- Visual Representation of Data: Charts and Graphs for Six Sigma
- Data Analysis Concepts
- Quality Tools for Six Sigma
- Process Capability Analysis for Sigma
- Measurement System Analysis: Gage Repeatability & Reproducibility (Gage R & R)

The volume I of this book contains approximately 450 pages and focuses on the ***DEFINE*** and ***MEASURE*** phases of Six Sigma. The book contains numerous examples, cases, and hands-on exercises using the MINITAB statistical software that allows one to master the Six Sigma concepts. The text provides step-wise computer instructions to learn and apply the Six Sigma tools in real world.

2. Six Sigma Quality using MINITAB: Statistical Tools in Six Sigma DMAIC Process: Volume II

The second volume of this series focuses on the ***ANALYZE***, ***IMPROVE***, and ***CONTROL*** phases of Six Sigma. This volume contains numerous examples, cases, and hands-on exercises using the MINITAB statistical software that allows one to master the Six Sigma concepts. The text provides step-wise computer instructions to learn and apply the Six Sigma tools in real world.

Software: MINITAB Statistical Software.

To order/rent the MINITAB Software, Release 15/16, log on to http://estore.e-academy.com or call 877-616-0662 in the U.S.

Course Description

Six Sigma is a business strategy that employs well-structured continuous improvement methodology and statistical tools to reduce defects and process variability. Six Sigma has been employed in numerous companies to reduce operating cost, eliminate waste, increase reliability, incorporate innovation in products and services, reduce cycle time, and increase productivity. The objective of a Six Sigma program is to reduce the variation in the process to the extent that the likelihood of producing a defect is virtually non-existent. This means improving quality, and meeting or exceeding customer expectations. The improved quality and reliability in products and services leads to higher perceived value, and increased market share thereby increasing revenues and profitability. The term sigma (denoted by the Greek letter,Φ) is a metric based on the statistical measure called standard deviation and is a measure of variability in a process. A metric is simply a measurement of some quality characteristic for example, percentage of defects. The term *six sigma* statistically equates to 3.4 defects per million opportunities. Thus, a Six Sigma process is capable of producing 3.4 defects per million opportunities (DPMO).

A commonly accepted customer definition of quality is that ***the quality of a product or service is a customer's perception of the degree to which the product or service meets his or her expectations***. Six Sigma is a customer-driven quality approach that aims at meeting or exceeding customer expectations. The underlying principles of Six Sigma are **customer focus**, **a team-based approach**, and **a process-focused approach based on continuous improvement**. **This course presents the philosophy and methodology of Six-Sigma, statistical tools used in Six Sigma, hands-on computer applications, and step-wise analysis and implementation of Six Sigma DMAIC (Define, Measure, Analyze, Improve, and Control) phase. This course uses MINITAB software to teach the statistical tools used in the DMAIC process.**

Upon completion of this training course, you will learn:

- Six Sigma Fundamentals
- Six Sigma Methodologies
- DMAIIC (Define-Measure-Analyze-Improve-Implement-Control) Process
- How the DMAIIC Model is used for Process Improvement
- Benefits and Implications of Six Sigma Program
- Relationship of Six Sigma Concepts to Overall Business Objectives
- Sigma Level and Defect per Million Opportunity (DPMO)
- Cost of Poor Quality: Detection vs. Prevention System
- Sigma Level and Process Capability
- Organizational Factors that are necessary groundwork for a successful Six Sigma Program
- Define a plan for Implementing Six Sigma in your organization
- Statistical and other tools in Six Sigma DMAIC process using MINITAB including
    - Data Collection
    - Graphical Techniques using Computer
    - Quality Tools for Six Sigma
    - Measurement System Analysis and R&R
    - Process Capability Analysis
    - Hypothesis Testing/ANOVA
    - Introduction to Design of Experiment (DOE)

- Regression Analysis and Modeling
- Introduction to SPC and control charts

➢ Case studies from manufacturing, service, and business process to present Six Sigma methodologies

Objectives:

- ❖ **Use the Six Sigma approach to quantify the critical quality issues in your company**
- ❖ **Learn how to integrate the principles of business, statistics, and engineering to achieve results**
- ❖ **Learn Six Sigma DMAIC process**
- ❖ **Learn the Six Sigma statistical tools used in Six Sigma using MINITAB**
- ❖ **Transform process improvement opportunities into clearly defined Six Sigma projects**
- ❖ **Use statistical tools to identify and determine relationship between inputs and outputs of a process**
- ❖ **Use Six Sigma methodologies to increase productivity and improve quality**
- ❖ **Reduce cost and reduce waste**
- ❖ **Reduce variation and improve quality and reliability**
- ❖ **Implement Six Sigma methods that ensure long term improvements**
- ❖ **Learn the concepts of Design for Six Sigma (DFSS) and Lean Six Sigma. Identify the right project for your company (Six Sigma, DFSS, or Lean Six Sigma. Learn how to choose the right project and when one project has priority over the other.**

Suggested Duration of Training:

On-line Training**: Self-paced/Self learning**

Blended Training: **As suggested by the company and participants**

Recommended Time: 16 weeks plus 2 weeks for the project. One week of training may be followed by one week of off time to allow the participants learn and complete the projects/assignments.

Face-to-face in Class Training: **10-15 weeks (approximately 40 hours distributed accordingly)**

It is strongly recommended that one week of training should be followed by one week of off time to allow the participants do their assignments/projects. This will enhance the learning process. For on-line and blended training, the Six-Sigma expert/trainer will be available on-line to answer questions. The trainer can also be contacted through e-mail and/or phone.

Tentative Training Schedule:

Week 1, 2, 3

What is Six Sigma?, Six Sigma Fundamentals/ methodologies
DMAIIC (Define-Measure-Analyze-Improve-Implement-Control) Process: Overview
Statistical and Other Tools used in DMAIC Process
How the DMAIIC Model is used for Process Improvement
Six Sigma Define Phase: project selection, presenting the business case, project risk/return analysis, cause-and –effect and Pareto analysis, project charter
Introduction and overview of: Process Improvement, Process Mapping, SIPOC, Quality Function Deployment, Failure Mode and Effects Analysis (FMEA), CTQs

Basic Statistics Concepts /Software Introduction (MINITAB)
Graphical Techniques using MINITAB
Descriptive/ Inferential Statistics Review
Probability and Probability Distributions Review
Probability Plots and Distribution Fit
Six Sigma Project Execution Steps
Project/ Case/Computer implementation

Week 4, 5, 6

Six Sigma Project Selection Criteria, Cost of Poor Quality
Six Sigma Measurement Phase
Quality Tools (MINITAB Applications)
Statistical Thinking
Data collection/ validation
Introduction to Control Charts
Process Capability Analysis
Measurement System Analysis
Gage R & R Analysis
Other Tools used in the Six Sigma Measurement Phase
Project/ Case/Computer Implementation

Week 7, 8, 9

Six Sigma Analysis Phase
Statistical Tools in Analysis Phase
Data Accuracy and Integrity, Visual Techniques (Mult-vari Chats, Matrix Plots, Scatter Plots, Run Charts, Pareto Chart, Cause-and-effect diagram)
Sampling and Sampling Distribution
Inference Procedure: Parameter estimation/ Sample Size Determination
Inference Procedure: Hypothesis Testing
Analysis of Variance using MINITAB
Correlation and Regression Analysis using MINITAB
Project/Case/Computer implementation

Week 10, 12, 13

Six Sigma Improvement Phase

Introduction to Design of Experiments
Strategy of Experimentation, Guidelines for Designing Experiments, Steps of Experimental Design, Simple Comparative Experiments, One-factor at a time, Paired Comparison Design
Factorial Experiments
One, Two, …Four- factor factorial design
Blocking, Latin Square
Fractional Factorial
Blocking
EVOP
Response Surface
Regression and Model Building using MINITAB
Improvement Objectives and Additional Tools (JIT and Kaizen, Process Re-engineering, Cycle Time Reduction, High Level SIPOC Maps, Poka-yoke, and Lean Principles
Project/Case/Computer implementation

Week 14, 15

Six Sigma Control Phase
Control plans
Control Charts using MINITAB : Basis of Control Charts
How, why, and at what stage the control charts work
Statistical Process Control (SPC)
Variable Control Charts
Attribute Control Charts, Other Types of Control Chart
Computerized Applications of Control Charts: all types
Project/Case/ Computer implementation

Week 16
Project overview and evaluation
Wrap-up. Topics may be added/deleted permitting time and project needs/ requirements

Projects/Assignments

Project/Assignment	Topic
1	**Concepts of Six Sigma, Lean Six Sigma, and Design for Six Sigma (DFSS)** **Review Power point Slides: Set 1** **Review Power point Slides: Set 2** **Visit Six Sigma related sites** **Read the Assigned Papers from the web** **Write a report (details will be provided)**
2	**Graphical Techniques for Six Sigma using MINITAB** **Visual Representation of Data: Describing and Analyzing Data using Charts and Graphs**
3	Six Sigma Define Phase Quality Tools for Six Sigma using MINITAB Project Definition, CTQs
4	**Six Sigma Measurement Phase** **Concept of variation, process variation, descriptive statistics and graphical summary, concepts of sampling and sampling distribution, drawing random samples using MINITAB, application of central limit theorem, determining sample size, estimation and confidence intervals, computer applications of above**
5	Six Sigma Measurement Phase Measurement System Analysis and Gage R &R using MINITAB Process Capability Analysis using MINITAB
6	Six Sigma Analysis Phase Hypothesis Testing: Minitab Applications Regression Analysis: Minitab Applications
7	Six Sigma Analysis Phase Regression Analysis and Model Building Model Building using MINITAB MINITAB Cases
8	Six Sigma Analysis/Improvement Phase Design of Experiment (DOE) One-to-k Factor Factorial Analysis using MINITAB Mult-vari Charts using MINITAB Regression Equations for Factorial Designs
9	**Six Sigma Improvement Phase** **Blocking, Latin Square and Factorial Designs** **Building and Running Factorial and Fractional Factorial Designs using MINITAB**
10	Six Sigma Control Phase Control Chart Applications

	Computerized Applications of Control Charts
11	**Comprehensive Project and evaluation** **Wrap-up, Final Exam/Final Project**

Note:

- At the completion of the training, you will be required to pass a black belt certification examination. The certification test can be taken anytime within an agreed time period to obtain the Black Belt certification.

- Although the training material provided to you at the beginning of the training will be sufficient to pass the certification examination; you may access the practice certification examination to better prepare yourself for the actual certification.

- The project completed in this Black Belt training will meet the project requirement for the Black Belt certification. No other project will be required if you complete this training.

- The training schedule above is tentative and can be tailored to meet your needs and requirements.

- The duration of the training can be adjusted to your convenience.

- The blended and in-class regular training can be provided at your company's site or at our site.

FEEL FREE TO CONTACT US BY CLICKING "CONTACT US" ON OUR WEBSITE OR CALL US IF YOU HAVE ANY QUESTION REGARDING THE TRAINING AND/OR THE CERTIFICATION.