# Learning Objectives – Lean Six Sigma Black Belt Course

The overarching learning objective of this course is to develop a comprehensive set of skills that will allow you to function effectively as a Six Sigma Black Belt. The Black Belt body of knowledge includes techniques for both quantitative and non-quantitative analysis, as well as the team leadership skills necessary to get projects across the goal line.

After completing this course, you should be able to **DO** the following:

**Communicate** using Six Sigma concepts.

**Think** about your organization as a collection of processes, with inputs that determine the output.

**Relate** Six Sigma concepts to the overall business mission and objectives.

Use the concept of a sigma level to **evaluate** the capability of a process or organization.

**Understand** and apply the five-step DMAIC model as a framework to **organize** process improvement activity.

**Employ** a wide range of process improvement techniques, including design of experiments, within the DMAIC model.

**Recognize** the organizational factors that are necessary groundwork for a successful Six Sigma effort.

**Employ** your Six Sigma skills to lead a successful process improvement project and **deliver** meaningful results to the organization.

# Course Content and Outline – Lean Six Sigma Black Belt

## 1. Introduction
- What is Six Sigma? Input/Output (X and Y) Relationship
- Six Sigma and Lean Enterprise
- Defects Per Million Opportunities Metric (DPMO)
- Success Stories
- Six Sigma History
- DMAIC Process
- Thought Process Mapping
- Six Sigma Organizational Structure
- Role of the Black Belt
- Exercises and Quiz

## 2. Define I – Prioritize
- Process Thinking
- Process Mapping
- Flow Charts, Value-Added Flow Charts, Deployment Flow Charts
- Spaghetti Diagrams
- Value Stream Mapping (Takt Time, Line Balancing)
- Balanced Scorecard
- Pareto Chart
- Project Selection
- Project Charter
- Project Tracking – Gantt Chart
- Stakeholder Analysis
- Exercises and Quiz

## 3. Define II – Voice of the Customer
- Customer Satisfaction & Kano Model
- Sample Surveys
- Survey Construction
- Margin of Error
- Affinity Diagrams
- CTQC Tree Diagrams, Critical to Quality Characteristics (CTQCs)
- Setting Specifications
- Quality Function Deployment
- Operational Definition
- Exercises and Quiz

## 4. Measure I
- Variable and Attribute Data
- Sampling Plan
- Measurement System Analysis
- Data Collection – Check Sheet
- Benchmarking
- Baseline DPMO & Sigma Conversion
- Rolled Throughput Yield
- Exercises and Quiz

## 5. Measure II
- Trend Chart
- Histograms
- Measuring Process Variability
- Statistical Process Control
- Rational Subgrouping
- X and Moving Range Control Charts
- Attribute Control Charts
- X-bar and R Control Charts
- Process Capability
- Exercises and Quiz

## 6. Analyze I – Potential Root Cause

- Cause and Effect Diagrams (Fishbone Charts)
- Five-Why, One-How
- FMEA
- Scatter Plots
- Regression and Correlation Analysis
- Multiple Regression
- Logistic Regression
- Exercises and Quiz

## 7. Analyze II – Hypothesis Testing

- Introduction to Hypothesis Testing
- Confidence Intervals and Hypothesis Testing
- Comparison of Two Treatments: Z-test, F-Test, t-test
- Comparison of Multiple Treatments – ANOVA, Chi-Square for Multiple Proportions
- Comparison of Variances – Chi-Square Test
- Non-parametric Testing
- Hy-Court TV TM Learning Lab
- Exercises and Quiz

## 8. Analyze III – Design of Experiments

- Introduction to Design of Experiments
- Single Factor Experiments
- Full Factorial Experiments
- Fractional Factorial Experiments
- General Factorial Experiments
- Experiment Simulations
- Advanced Topics
- Exercises and Quiz

## 9. Improve

- Design for Manufacturability/ Serviceability/Repairability (DFSS)
- Brainstorming
- Continuous Flow (Little's Law)
- Quick Changeovers
- Implementing Work Cells
- Theory of Constraints
- Pull Scheduling
- Narrowing the List of Ideas
- FMEA
- Error-proofing
- Corrective Action Matrix
- Piloting a Solution
- System Dynamics
- Exercises and Quiz

## 10. Control

- Control Plan
- SPC Revisited
- FMEA Revisited
- Visual Control – 5-S
- CHECK Process
- Total Productive Maintenance
- Best Practices – Integrating Success
- Exercises and Quiz

## 11. Tools for Success

- Leadership
- Team Development
- Leading Teams
- Leading Change
- Exercises and Quiz

# Course Overview – Lean Six Sigma Black Belt

This Lean Six Sigma Black Belt course is comprised of 11 separate sessions (or units). Each session is a collection of related lessons and includes an interactive quiz at the end of the session. Most of the lessons include interactive practice exercises. All course material is available online, and sessions may be started and stopped at any point—content is delivered on-demand according to your schedule.

By completing this course of study, you will gain a solid general knowledge of the theory, composition, and implementation of a Lean Six Sigma initiative. You will also become proficient in all of the analytical tools necessary to define, measure, analyze, improve, and control Lean Six Sigma improvement projects, including the design and analysis of general and fractional factorial experiments. You will learn team leadership and project management skills. In short, as a Black Belt you will master the skills necessary to lead a complex process improvement project that produces bottom-line results.

## Course Structure and Requirements

This course provides content on-demand to offer the highest degree of student flexibility. You can set your own schedule and progress at your own speed, terminating and re-entering sessions whenever you wish.

All course sessions use a mix of multimedia to present material, including text, synchronized audio slide shows, diagrams, charts, audio lectures, and simulations. Links to outside research resources are provided to explore chosen subjects in greater detail.

As you work through the course you will be asked to demonstrate knowledge and understanding in four ways:

**Interactive Practice Exercises** will be presented throughout each session so that you can try your new skills and get immediate feedback.

**Supplemental Exercises** will be presented at the end of every session to practice new concepts. Supplemental exercises are self-graded and may be shared in the Virtual Classroom Discussion area.

**Quizzes** will be conducted at the end of every session. Quizzes are interactive and provide immediate feedback to close the learning loop.

**Black Belt Project:** A Six Sigma project must be completed successfully and submitted for evaluation before a Black Belt certification is awarded. The project must demonstrate full knowledge of Six Sigma concepts and tools, and must deliver actual bottom-line results.

The project is submitted at two points: after the definition phase to ensure that the project will meet the guidelines for Black Belt certification, and upon completion.

## Course Sequence

The course is presented in a logical sequence to follow the Six Sigma DMAIC improvement process. We believe that you will learn most efficiently by following the sequence presented. In particular, the first session presents an overview of Six Sigma, which will be helpful to put the remaining sessions in proper context. However, the sessions are modular, and we encourage you to explore the material. You are free to move forward and backward throughout the course. You can skip ahead or go back and review material that you already covered. The course map feature allows point-to-point navigation, from anywhere to anywhere. The course map status column will tell you which pages you have not visited.