



## **Lean Six Sigma Black Belt – LIVE ONLINE**

20 – 4 hours including breaks; sessions run 8:30 am to 12:30 PM Eastern Time U.S.A. (2 sessions per week for 10 weeks) (approximately 80 hours of training) plus you must do two LSS projects (case studies, approximately 80 hours homework) online. Lean Six Sigma Black Belt Certificate from Thayer School of Engineering at Dartmouth will be awarded upon successful completion of coursework, test, and two online projects.

**Notes:** Instructors and dates are subject to change depending upon availability of instructors.

1. We use Mini-Tab in this workshop. Mini-tab is available for free trial for 30 days and **MUST** be run on a Windows PC. Sign up for Minitab just prior to using it to make sure the trial does not run out before you do the case study and test.
2. Built-in speakers and microphone do not work well due to echo effect so headset with microphone is necessary. This gives you complete interaction with the instructor and other participants. No phone calls to make, just login, turn your volume to the proper level and you should be all set to participate, or use the phone if you prefer.

### **Black Belt Curriculum**

(this workshop can also be conducted on-site, subject to price change and number of participants)

**Note: Instructors may change due to availability of the instructor**

### **Required Manual Purchase:**

Paper Version (**Be sure to purchase the Minitab V17 version**): **Black Belt Course Manual: Fourth Edition \$89.95 plus shipping. Available at:**

<https://www.opensourcesixsigma.com/ProductDetails.asp?ProductCode=CM-BB>

**OR**

Pdf Version (**Be sure to purchase the Minitab V17 version**): **The Certified LSS Black Belt eBook \$89.95 delivered immediately online. Available at:**

<https://www.opensourcesixsigma.com/ProductDetails.asp?ProductCode=EB-BB>

No need to purchase both the paper and the soft versions; they are both fourth edition.

## **Day 1 & 2: (two - 4 hour days) Bill Sloma**

### **Review**

- **Lean & Six Sigma Refresher**
  - Learn Basic Definitions (Process, Lean, Six Sigma)
  - The DMAIC Model with Gate Reviews
  - Basic Tools (Problem Statement, SIPOC)
  - Performance Based Metrics, DPU, DPMO
  - Practice with examples

### **Define Phase**

- **Voice of Customer (VOC)**
  - Describe the importance of VOC, and VOB

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- Define and clarify CTQ and COPQ
  - Understand how to segment Customers
  - Learn how to capture Voice of Customer
  - Describe the development of Critical Customer Requirements (CCR)
  - Create a CCR Tree - Practice
  - Learn how to use Kano Analysis
- **Project Justification – Building the Business Case Utilizing the VOC**
    - Define the Business Case – Why?
    - Learn to utilize the business case to justify the need for the project
    - ROI of Quality / Project ROI
    - Pitching the Case – VOC & VOB
    - An Example

**Day 3 & 4:— (two - 4 hour days) Tim King or Dave Rogerson**

### **Define Phase**

- **Performance Management & Team Accountability**
  - Performance management as a System
  - Our responsibility as a Leader
  - Setting expectations
  - Accountability! It means a lot
  - Holding one Accountable
- **Project Control & Change Management**
  - Developing and revising the Project Charter
  - Project management Fundamentals
  - Managing personal and organizational change
  - Red-Yellow-Green status and action plans
  - Using the A3 tool to report project status
  - Risk response
  - Managing deliverables: requirements, testing, implementing, passing ownership
  - Managing change at the individual, team and organizational level

**Day 5 & 6: (two - 4 hour days) Jim Hall**

### **Measure Phase**

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- **Lean & Six Sigma Tools and Techniques**

- Value Stream Mapping
- Histograms
- Pareto
- Cause & Effect Diagram
- DFMEA
- PFMEA

### **Day 7 & 8: (two - 4 hour days) Jim Hall**

#### **Measure Phase**

- **Math**
  - Basic Algebra in Brief – A short refresher
  - Six Sigma symbols
- **Statistics Refresher**
  - Common and special cause variation
  - Variation and the normal curve
  - Types of Data (Attribute, Variable (continuous))
  - Measures of Central Tendency
  - Concept of Standard Deviation
  - Process Capability: Cp and Cpk
- **Introduction to Mini-Tab**
  - Working with Mini-Tab
  - Utilizing the book for practice – Open Source Black Belt Course Manual: Fourth Edition, Minitab version.

### **Day 9 & 10: (4 hours) Dr. Lasky**

#### **Analyze Phase**

- **Scales of measurement**
- **Advanced Stats**
  - Confidence Interval Review
  - Hypothesis Testing Review
  - Sample Size
  - Type II Error and Power

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- Hypothesis Testing of Variance
- Tolerance and Prediction Intervals
- Tests on a Proportion
- Statistical Inference for Two Samples
- Using Minitab to Solve Advanced Stats Problems
- Sampling Strategies to Determine Quality Levels

**Day 11 & 12: (two - 4 hour days) Dr. Lasky**

#### **Analyze Phase**

- **Advanced SPC**
  - SPC Review
  - Advanced Gage R&R
  - Shewhart Rules
  - SPC for Non Normal Data
  - Minitab Examples

#### **Improve Phase**

- **Technical Estimating**
  - Importance
  - Tips
  - Examples
- **Intermediate DOE**
  - DOE Review
  - Analysis of Variance
  - Blocks
  - Full Factorial DOE
  - Several Minitab Examples

**Day 13 & 14: (two - 4 hour days) Dr. Lasky**

#### **Improve Phase**

- **Intermediate DOE**
  - Fractional Factorial DOE
  - Taguchi DOE
  - Central Composite Design
  - Response Curve Methodology

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- Multiple Linear Regression
- Numerous Minitab Examples

### **Day 15 & 16: (two - 4 hour days) Dave Rogerson**

#### **Control Phase**

- **Lean Culture**
  - Building a lean culture
  - 5S
  - Visual Workplace
  - Standardized Work

### **Day 17 & 18: (two - 4 hour days) Bill Sloma**

#### **Control Phase**

- **Kaizen Planning**
  - What is a Kaizen?
  - 5s Kaizen Example
  - Kaizen Event Flow Example
  - When to Kaizen
  - When Not to Kaizen
  - Chartering a Kaizen
- **Controlling Defects**
  - Mistake proofing
  - Control Plans
  - Response Plans
- **8D for Containment & Control**
  - 8D – The steps to root cause and control

### **Day 19 & 20: (two - 4 hour days) Natalie Riblet (optimization)/Vikrant Vaze (scheduling)**

#### **Other Process Tools & Techniques**

- **Optimization:**
  - Introduction to Optimization
  - Review Key Definitions
  - Linear Programming
  - Integer Programming

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- Programming with Excel
- Applications
- Scheduling:
  - Definitions and Jargon
  - Overview of Different Production Scheduling Environments
    - Single machine scheduling
    - Parallel machine scheduling
    - Flow shops
    - Others
  - Typical Assumptions used in Scheduling
  - Performance Measures
  - Scheduling Techniques (Algorithms and Heuristics)
    - Focus on Single Machine Scheduling Techniques
    - Brief visits to other environments



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**Case Studies:** *Approximately 10 days to complete.*

**You will be required to do two case studies online.**

**Definition of online case studies:** (communicate answers and questions via email to the assigned instructor).

Choose two of the case studies below, which must be completed within 10 business days of the last class. You should be working on the case study as the workshop progresses (**Do Not wait until the end of all classes and Do Not jump ahead of the class; use Mini-tab for your work, not EXCEL**). Email the completed case study to [ronald.lasky@dartmouth.edu](mailto:ronald.lasky@dartmouth.edu). You will be asked to continue to work on the case study until you have the correct answers or have made progress to the satisfaction of the assigned instructor.

*Those who do not return the case studies within 10 business days of the last class will not be eligible for the LSS Black Belt Certification unless you ask for and are granted an exception by Dr. Lasky.*

The sample case studies will be provided by Dartmouth and you can select two of the following verticals:

- Manufacturing
- Finance
- Healthcare

**Exam - Take Home Exam:** (approx. 20 hours)

This exam is take-home. You must complete the exam and email it to the instructor within 10 business days of the last session on day 20. *Those who do not return the exam within 10 business days will not be eligible for the LSS Black Belt Certification unless you ask for and are granted an exception by Dr. Lasky.*

This is an open notes exam so you can use all of the material that the instructors have provided to you. The exam will be primarily question and answer format.

**Pre-requisites for taking the LSS Black Belt Workshop:**

A LSS Green Belt Certification from Dartmouth College or from an equivalent source (this may include in-house workshops that are employer sponsored and taught by a qualified instructor(s)). *The workshop must have included introduction of statistics or you must have taken statistics at the college level prior to this LSS Black Belt workshop.*

**NOTE ABOUT PRE-requisites:** If you are concerned about having the proper pre-requisites for this workshop contact us at [ronald.lasky@dartmouth.edu](mailto:ronald.lasky@dartmouth.edu) ; we'd be happy to answer any questions for you.