

Lean Six Sigma Green Belt – LIVE ONLINE

10 – 4-hour sessions 10:00 am to 2:00 pm Eastern Time in U.S.A. (2 session per week for 5 weeks) for a total of 5 days. Lean Six Sigma Green Belt Certification awarded by Thayer School of Engineering at Dartmouth upon successful completion of all requirements)

LSS Green Belt Curriculum

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

Pre-requisites for taking the LSS Green Belt Course:

Basic algebra capable; if you are not confident in your algebra skills then it is best to take the Lean Six Sigma Yellow Belt course.

Notes: PLEASE READ THOROUGHLY

- Administrator Contact:** if you are experiencing difficulty at any time please contact Larry Parah, lparah@blueskyetrack.com...No problem is too small or too large; we respond in the same business day, or early the following day if your contact is late the previous day.
- We use Minitab in this course. Minitab is available for a free trial for 30 days and it is best 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. A Minitab license is available for participants of this course. This fee is in addition to the course fee. Non-participants are not eligible for the Minitab license so please do not purchase if you are a non-course participant. Email the administrator for purchase access.

	6-month license	12-month license
Quantity	Per participant	Per participant
Minitab 18	\$359.00	\$469.00
- 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.
- All sessions are recorded so you may elect to do this course as self-study by downloading the recordings to your computer and completing the necessary work for certification. In other words, you do not have to attend sessions if your time does not permit it. Three instructors (one will be selected based on type of question) will be available to answer questions via email or phone call if you elect to do self-study. If you want to do self-study you must email the administrator to get permission prior to the start of the workshop.

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5. Instructors and dates are subject to change depending upon availability of instructors.

6. Case Study:

ONE case study is required. Choose one of the case studies below, which must be completed within 10 **BUSINESS** days of the last class. You will receive all the case studies before the course begins. You should be working on the case study as the course progresses (Do Not wait until the end of all classes and Do Not jump ahead of the class; use Minitab for your work, not EXCEL). We encourage you to work on each question in the case study right after the material for that question is taught, perhaps on the weekend after the classes. In this way the material is still top of mind and more easily accessible.

Include your Minitab diagrams in the case study. **Return the case study in ONE WORD document. Separate documents will not be accepted. Email to: Ronald.C.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. The case study should be completed in 10 to 24 hours. It is a pass/fail.

Those who do not return the case study within 10 business days of the last class will not be eligible for the LSS Green Belt Certificate (unless you have asked for and been granted additional time). Additional time will be allowed if you supply a projected finish date.

You will get to choose only ONE of the following Case Studies from the Drop Box:

- Manufacturing
- Financial
- Healthcare

7. Take Home Exam

This take home exam is required. You must show your own original work on the exam and must work independently. Contact the instructor for help and guidance; *do not* contact other participants. You must complete the exam and email it to the instructor within 10 **BUSINESS** days of the last session on day 10. *Those who do not return the exam within 10 business days will not be eligible for the LSS Green Belt Certificate (unless you have asked for and been granted additional time). Additional time will be allowed if you supply a projected finish date.*

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The exam is emailed to you shortly after Day 10 ends.

Include your Minitab diagrams in the exam. **Return the exam in ONE WORD document. Separate documents will not be accepted.** **Email to: Ronald.C.Lasky@Dartmouth.edu**

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 with the math that you have learned during the course. It is roughly 60% math problems to solve and 40% non-math. The exam should be completed in 8 to 20 hours. It is a pass/fail exam. You will be given a second attempt to pass the exam, updating the questions that you have not answered properly or in full.

8. The statistics lectures may run less than 4 hours then the instructor may assign take home examples as homework to be completed by the participant.
9. Course Materials Included:
 - Pdf's of all instructor PPTs
 - LSS Toolbook developed by BlueSkye Track, Inc. and Thayer School of Engineering at Dartmouth College
 - WebEx recordings of all Live Online lectures in MP4 format
 - Case studies (3), and Test
10. Drop Box Access: a drop box will be set-up for access to the above materials which you can download approximately 1 week prior to the course; recordings are in the drop box within 24 hours of the end of the class. The drop box is available for up to 5 days of the end of the class. You must download materials to your computer. For self-study you will be using recordings from a prior course.
11. Equipment Required (not furnished):
 - a. Computer running a browser with internet access; Chrome browser is preferred; other browsers may work but have not been fully evaluated.
 - b. Headset with microphone for Voice Over Internet Protocol or the capability to call-in to a toll phone number.
 - c. The ability to play MP4 recordings...use Windows Media Player or equivalent
 - d. Prefer Windows 10 to run Minitab 18; Mac does work but may have limited capability

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Day 1: (approx. 4 hours including breaks)

Same content as LSS Yellow Belt

The Process / The Customers

- What is a Process?
- What Do Our Customers Want
- Management, Core & Support Processes

Lean

- Origins of Lean
- What is Lean?
- The 7 Wastes of Lean
- Value Analysis
- The Lessons of Lean
- Analysis Tool: “Value-Add” Assessment
- Takt Rate Analysis
- Visible Workplace

Six Sigma Section

- Six Sigma History
- What is Six Sigma?
- How Capable are your Products & Services
- Why 99% Yield is Not Good Enough
- Six (6) Causes of Variation

Lean Six Sigma Integration Section

- What is Lean Six Sigma?
- Why Combine Lean & Six Sigma?

The DMAIC Methodology (Define, Measure, Analyze, Improve, Control)

- Funnel-Down Many Variables to the Critical Few!
- High Level DMAIC Approach

Define

- Define Activities and Tools
- Project Charter Elements
- Building an Opportunity or Problem Statement
- Opportunity or Problem Statement Example #1
- Opportunity or Problem Statement Example #2

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- Creating the SIPOC Map and Developing Metrics
- Define Phase Completion Check

Day 2: (approx. 4 hours including breaks)

Same content as LSS Yellow Belt, in-class case study may vary

The DMAIC Methodology (Continued)

Measure

- Measure Activities and Tools
- Value Stream Map Example
- Value Stream Map Symbols
- Measure – What gets measured?

Analyze

- Analyze Activities and Tools
- Cause and Effect Diagram
- How to Build a Cause and Effect Diagram
- Cause and Effect Diagram Example
- Pareto Chart

Improve

- Improve Activities and Tools
- Solution Plan
- Solution Plan Example
- Improve Completion Checks

Control

- Control Activities and Tools
- What is a Control / Response Plan?
- Control / Response Plans Questions?
- Control Completion Checks

Review & Questions

Day 3: (approx. 4 hours including breaks)

Lean in Detail

Identifying & Evaluating Waste

- Seven wastes

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- POKA YOKE

Flow

- Definitions & Simulations
- One-Piece Flow
- Batch or Batch Processing
- Considering Set-up & Machine Downtime

Level Loading

- What is it?
- How might you achieve level loading?

Push/Pull Systems/Lead Times

- Push Definition and Example
- Pull Definition and Example
- Establishing Lead Times and setting Goals

Layout the Workflow

- Functional Layout
- Product Layout
- Dedicated Work Cells

Sustaining Continuous Improvement

Day 4: (approx. 4 hours including breaks)

Value Stream Mapping

Visual Management

- Gemba

Types of Maps

- Flowcharts (process maps)

Value Stream Mapping (VSM) Overview

- What is a VSM?
- When do you use a VSM?

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VSM: Methods & Implementation

- Symbols (Icons)
- Steps to the Present State Map
- The Data Box
- Using Little's Law
- Push, Pull, KANBAN, FIFO
- Steps to the Future State Map
- Putting VSM to Work

Day 5: (approx. 4 hours including breaks)

Math

- Basic Algebra in Brief – A short refresher – [Self Study in Drop Box](#)

Same content as LSS Black Belt

Statistics Refresher & Minitab Introduction

- Six Sigma symbols
- Common and special cause variation
- Variation and the normal curve

Day 6: (approx. 4 hours including breaks)

Same content as LSS Black Belt

Statistics Refresher & Minitab Introduction (continued)

- Types of Data (Attribute, Variable (continuous))
- Measures of Central Tendency
- Concept of Standard Deviation
- Process Capability: Cp and Cpk
- Working with Minitab

Day 7: (approx. 4 hours including breaks)

Statistics for Lean Six Sigma

Purpose(s) of Using Statistics

- To Define a problem objectively and precisely
- To make an inference about the population from a sample
- To control a process
- Learning to think statistically

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Variation and the Normal Curve

- The Concept of Variation
- The Normal Curve
- Population vs Sample
- Central tendency
- Poisson Distribution
- Bi-nomial Distribution

Data and Variation

- Drawing and using Histograms
- Calculating cell intervals
- Histogram analysis (random, capable, centered, acceptable process)

Day 8: (approx. 4 hours including breaks)

Statistics for Lean Six Sigma (*continued*)

Measures of Central Tendency

- Arithmetic Mean (average)
- Media
- Mode

Standard Deviation

- Definition
- The formula

Confidence interval of the mean

- Numerous exercises
- Hypothesis testing
- Numerous exercises

Day 9: (approx. 4 hours including breaks)

Statistical Process Control (SPC)

What is SPC and why use it?

- Definition
- Expected Variation (common cause)
- Unexpected Variation (special cause)
- Precision & Accuracy
- Gage R&R analysis
- SPC Charts

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- Purpose of a control chart
- The control chart elements
- X-bar charts (example)
- R-bar charts
- X-bar R charts
 - UCL/LCL
 - USL/LSL
- Building an X-bar R chart (examples)
- Interpreting a control chart
 - Shewhart Rules
- Types of Data (attribute, variable)
- Pareto Charts
- Six Sigma (+/-6 standard deviations)
- Why is standard deviation important (C_p & C_{pk})?

Day 10: (approx. 4 hours including breaks)

Introduction to Design of Experiments (DOE)

- What is DOE and why use it?
- DOE Size
- Steps to Conducting a DOE
- DOE Example(s) and Exercises using Minitab