

# Lean Six Sigma Black Belt – (12 days)

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## Overview -

ProgressivEdge Lean Six Sigma Black Belt (LSS BB) training and certification develops LSS BB practitioners that are prepared to apply the LSS tools and deliver results. The ProgressivEdge LSS BB's receive a balance of management skills (project/team/change management) and tool application to achieve the desired process improvements.

## Who Should Attend? –

Anyone interested in improving processes by way of structured methodology, statistics and team work. This can be in any industry on any process by someone in any position. The ideal candidate would be a full-time Continuous Improvement Specialist.

## Course Objectives –

- ❑ Learn the combined Lean Six Sigma tools at a Black Belt level
- ❑ Acquire the ability to select projects, develop teams and deliver results
- ❑ Apply concepts to a project impacting the bottom line
- ❑ Prepare the LSS BB to deploy LSS to other individuals in their organizations
- ❑ Begin developing abilities to teach LSS White, Yellow, and Green Belt

## Certification –

Certification requires individuals to attend all training, pass an assessment, complete 1 project, facilitate 1 kaizen event, deliver results of at least \$100,000 annual savings and present the project.

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## Prerequisites –

- ❑ Identify at least two possible projects (processes in your business to improve)
- ❑ Desire to learn and apply the tools. Bring a laptop to the first day of class.
- ❑ Basic knowledge of PowerPoint® and Excel®.
- ❑ Green Belt training is not a prerequisite for this Black Belt course.

## Course Includes –

- ❑ Face-to-face live Instructor class room training
- ❑ Well organized workbooks, software (SPC XL and DOE Pro), and text books
- ❑ Public sessions include drinks, morning snacks, lunch, and afternoon snacks
- ❑ References, glossary, case studies, examples
- ❑ Certification after requirements are met
- ❑ Mentoring from beginning to end of successful project

## Support-

Learning and applying Lean Six Sigma requires the support of a mentor. All Black Belts will receive a Master Black Belt (MBB) mentor that is available throughout the project. Support can be achieved by:

1. Phone or e-mail – for free, “real-time” MBB support via e-mail or cell phone direct
2. On-site support – for a fee, the MBB can meet with you for face-to-face project work

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## Why Choose ProgressivEdge?–

ProgressivEdge has many years of experience applying Lean Six Sigma obtaining quantifiable results on real problems with real solutions. There are many reasons to choose ProgressivEdge for your training and implementation needs:

- Learning Format** Start with the basics and grow from there. Training is fun and interactive.
- Application** Years of experience are provided as ProgressivEdge Instructor/Consultants have applied Continuous Improvement in a variety of industries. Very practical and immediate application.
- Complete Program** Utilize DMAIC model with integrated Lean Six Sigma; many additional Continuous Improvement skills are taught, as well as a variety of tools (files and concepts).
- Instructors** Friendly, welcoming, understanding, good listeners, helpful and effective. Individual Instructors can work strategically and tactically.
- Materials** Work books are easy to understand, easy to reference when needed later, and well organized. Simple and user friendly software.
- CEU's** Continuing Education Units can be provided on request
- ETP Funding** In California, ETP state funding is available for some industries
- Flexibility** On-site training can be tailored to meet your timing and content

# Lean Six Sigma Black Belt Week 1 (a.k.a. LSS Green Belt)

Define	Module 1	Project Charter / Project Selection	Day1
	Module 2	Lean Six Sigma Introduction	
	Module 3	Deployment of Lean Six Sigma	
	Module 4	Cost Savings Analysis	
Measure	Module 5	5 Lean Principles and 8 Wastes	Day2
	Module 6	Value Stream Mapping	
	Module 7	5S and Visual Management	
	Module 8	Process Flow	
	Module 9	Introduction to Variation	
Analyze	Module 10	Performance Measurements	Day3
	Module 11	Quality Concepts and the 7 Quality Tools	
	Module 12	Control Charts	
	Module 13	Measurement System Analysis	
	Module 14	Root Cause Analysis	
Improve	<b>Project reviews / updates and mentoring</b>		Day4
	Module 15	Failure Modes Effects Analysis	
	Module 16	Kaizen	
	Module 17	Flow and Pull (kanban, level load...)	
	Module 18	Set-up Time Reduction	
Control	Module 19	Design of Experiments Introduction	Day5
	Module 20	Mistake Proofing	
	Module 21	Standardization	
	Module 22	Controls	
<b>Next Steps and Assessment</b>			Day 6
<b>Final Project Presentations and Certification</b>			

# Lean Six Sigma Black Belt – Weeks 2 and 3

## Week 2

Module 23 Project Management  
Module 24 Change Management  
Module 25 Team Building  
Module 26 Data Collection

Day 6

Module 27 SPC for Attribute  
Module 28 Inferential Statistics  
Module 29 Hypothesis Testing  
Module 30 Process Modeling Regression

Day 7

Module 31 DOE Planning  
Module 32 DOE – Full Factorial  
Module 33 DOE – Fractional Factorial

Day 8

## Week 3

Module 34 Capability Analysis  
Module 35 Historical Data Analysis  
Module 36 Measurement System – Advanced  
Module 37 Variation – Advanced  
Module 38 Champion Development

Day 9

Module 39 Train-the-trainer  
Module 40 Theory of Constraints  
Module 41 Total Productive Maintenance  
Module 42 Benchmarking

Day 10

Module 43 Voice of the Customer  
Module 44 DFSS Introduction  
Module 45 Training Plans  
Module 46 Control Plans - Advanced

Day 11

**Next Steps and Assessment**

**Final Project Presentations and Certification**

Day 12

# Module Content – Week 1 BB (a.k.a GB)

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**Modules may contain: examples, simulations, videos, project application**

## **Module 1            Project Charter / Project Selection**

Goal tree, PACE chart, prioritization matrix, project charter, SMART, project kick-off

## **Module 2            Lean Six Sigma Introduction**

Basic into to: why LSS, benefits of LSS, basic rules, descriptions, history, 5 Lean principles, value, 8 wastes, VSM, takt, push vs. pull, batching, 5S, kaizen, action results summary, Six Sigma concepts, 3 generations of Six Sigma, variation, DMAIC, normal distribution, standard deviation, similarities and differences of LSS, applications

## **Module 3            Deployment of Lean Six Sigma**

10 steps to deployment, LSS maturity, roles of LSS, skills and attributes, responsibilities, Leaders roles, change model, quality questions, LSS metrics, incentives, training, project identification and selection, project reviews, notebooks, Lean score card, certification, lessons learned, application to organization

## **Module 4            Cost Savings Analysis**

Waste walk, value lever tree, finding savings, cost of poor quality, cost savings calculations, analyzing payback

# Module Content – Week 1 BB (a.k.a GB)

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## **Module 5            5 Lean Principles and 8 Wastes**

Video, lead-time, cycle time, TPS, elements, 8 wastes, simulation, Lean principles

## **Module 6            Value Stream Mapping**

Benefits of VSM, objectives, bull whip effect, traditional vs. VSM, samples, case study to create a VSM, video, 5 steps, VSM levels, product family matrix, Value Stream Managers, mapping details and icons, data slips, barriers to flow, 8 questions, takt calculation and application, balancing, delivery method, FIFO lane, supermarket, kanban, action plan, follow up

## **Module 7            5S and Visual Management**

5S kaizen event approach, 5 S's defined, red tag, audits, standards, video, examples, visual display vs. visual controls

## **Module 8            Process Flow**

Flow chart, IPO, linked IPO, SIPOC, process mapping, swim lane, VSM

## **Module 9            Introduction to Variation**

Rules, simulation, types of data, converting data, histogram, box and whisker, run chart, control chart, scatter plot, pareto, mean/median/mode, range variance, standard deviation, normality, z-score, sigma score, population vs. sample, sigma shift, hypothesis testing

# Module Content – Week 1 BB (a.k.a GB)

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## **Module 10          Performance Measurements**

What and Why, making money, planning, approaches to, 6 performance categories, traditional vs. new, video, scorecards, metrics, open book, system application

## **Module 11          Quality Concepts and the 7 Quality Tools**

Yield, rolled throughput yield, RTY vs. sigma score, PPM, DPMO, Cp and Cpk, pareto, cause & effect, stratification, check sheets, histogram, scatter plot, control chart, case study

## **Module 12          Control Charts**

Control chart related to histogram, common vs. special cause, ImR and Xbar R charts, out of control rules, zones, patterns, recalculating limits, rational sub grouping, variable and attribute defined

## **Module 13          Measurement System Analysis**

Sources of variation, accuracy/precision/bias, measurement discrimination, types of MSA, analysis methods, terminology, gage R&R, Kappa, ICC, exercises

## **Module 14          Root Cause Analysis**

Root cause analysis, 5 why's, cause & effect diagram (fish bone), cause & effect matrix



# Module Content – Week 1 BB (a.k.a GB)

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## **Project Updates (present to class)**

Project update form

## **Module 15 Failure Modes Effects Analysis**

Defined, types of FMEA, applications, when to apply, steps to create, sample

## **Module 16 Kaizen**

Kaizen vs. kaizen events, steps to kaizen events, video, Managements roles, project application, strategic application

## **Module 17 Flow and Pull (kanban, level load...)**

Barriers to flow, tests for flow capability, balance, one piece flow, supermarket, cells, monuments, FIFO lane, waterspider, point of use, admin flow, kanban rules, kanban types, kanban cards, calculations, load smoothing, heijunka

## **Module 18 Set-up Time Reduction**

Defined, examples, related to wastes, elements of changeover, batch size, economic order quantity, ICE, using video, documenting, awareness video, checklists, functional checklists, transportation

# Module Content – Week 1 BB (a.k.a GB)

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## **Module 19      Design of Experiments Introduction**

Defined, interactions, benefits of, 3 phases, full and fractional factorial explained, empirical model, when not to do DOE, DOE questions

## **Module 20      Mistake Proofing**

What and why, related to COPQ, types of errors and sources of defects, 3 levels, applications, simulation, 7 steps, video

## **Module 21      Standardization**

Simulation/activity, standardization related to sustained results, standardization, standards, standard work sheet, videos

## **Module 22      Controls**

Control and reaction plan, control charts, assessments, standards, mistake proofing

**Module 22 is the last module of LSS Green Belt and concludes week 1 of LSS Black Belt.**

# Module Content – Week 2 BB

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## **Module 23      Project Management (PM)**

Project discussions and reviews, LSS BB roles, project characteristics, traditional project management, PMI, effective PM's, PM groups, PM phases, action plans, A3, gantt charts, CPM, PERT, project closure, documentation, post audit, PM video

## **Module 24      Change Management (CM)**

CM videos, why change, how we see change, successful and unsuccessful change exercise, benefits/risks matrix, 5 components of change (detailed), readiness for change and actions for change exercise, motivators, traits, ladder of accountability, culture of change, time vs. culture, tips, quotes

## **Module 25      Team Building**

SPACER, ice breaker, project charter details, charter videos, team selection, team composition, team size, team roles, stages of development, team development vs. leadership style, motivations and rewards, effective meetings, communication, conflict resolution, video, team building exercises

## **Module 26      Data Collection**

Why collect, data plans, effective surveys, methods of gathering VOC, sampling methods, data on projects

## **Module 27      SPC for Attribute**

Project updates, common vs special, attribute defined, c chart, u chart, p chart, np chart, converting attribute to variable, project application

# Module Content – Week 2 BB

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## **Module 28      Inferential Statistics**

Sample vs population, central limit theorem, software application: confidence interval for mean/standard deviation/proportion, sample size, confidence level

## **Module 29      Hypothesis Testing**

Terminology, p value, example application, one sample t-test, two sample t-test, paired t-test, nonparametric

## **Module 30      Process Modeling Regression**

Scatter plot correlation coefficient r value, linear regression, residuals, prediction, goodness of fit (Anderson-Darling and Kolmogorov – Smirnov), non-normal distribution, skewness, kurtosis, data transformation for non-normal

## **Module 31      Design of Experiments (DOE) Planning**

DOE defined, history, when not to DOE, march of science, DOE worksheet, planning, three phases, types of DOE: single factor, multi-factor, fixed effect, random effect, mixed model, interpreting experiment

## **Module 32      DOE – Full Factorial**

Why and when full factorial, examples, nomenclature, runs, levels, factors, responses, ANOVA, empirical model, models, software training

# Module Content – Week 2 BB

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## **Module 33      DOE – Fractional Factorial**

Factorial designs, screening/characterizing/optimizing, nomenclature, aliasing/confounding, resolution, DOE methodology, examples, graphics, interpretation, class experiment with software, project application

## **Module 34      Capability Analysis**

Capability indices, within/between, data, Cp/Cpk – long and short term

## **Module 35      Historical Data Analysis**

Purpose of, graphical analysis (multiple graphical tools), change over time: Change Point Analysis, point estimates of mean, statistical tolerance interval

## **Module 36      Measurement System – Advanced**

Extended look from GB, precision, accuracy, class exercises, what and when, repeatability, reproducibility, measurement discrimination, bias, stability, linearity, crossed and nested, MSA process and guidelines, gage R&R ANOVA exercise

## **Module 37      Variation – Advanced**

X-Y matrix, software applications: summary stats, probability for binomial, probability for poisson, probability for normal, scatter diagram, multi-vari with box plots

# Module Content – Week 3 BB

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## **Module 38      Champion Development**

LSS Champion roles, Hoshin planning, PDCA, DMAIC strategy, VSM strategy, TQM strategy, SWOT analysis, x-matrix to action plan, leadership vs. management, types of leadership, LSS staffing, resource involvement impact, champion and project selection tool, project tracking, toll gate review, tracking systems, case study review

## **Module 39      Train-the-trainer**

Characteristics of learning, tips for instructor, laws of learning, class becomes trainers, psychology rules of learning, personal preparation, co-training, confidence, greetings, ice breakers, ground rules, leading vs. directing, answering questions, listening skills, dealing with difficult situations, concluding

## **Module 40      Theory of Constraints**

Defined, types of constraints, simulation, drum-buffer-rope, video, rules

## **Module 41      Total Productive Maintenance**

Defined, breakdown, preventive, productive, 6 big losses, OEE measurement, TPM calculations, predictive methods, proactive vs. reactive, operator involvement, 5S, video

## **Module 42      Benchmarking**

Competitive vs. comparative benchmarking, as a project, published sources, videos, resources

# Module Content – Week 3 BB

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## **Module 43      Voice of the Customer**

Defined, videos, IPO and VOC, critical to quality, quality function deployment, Kano model, team exercise, VOC quantified

## **Module 44      Design for Six Sigma Introduction**

Defined, exercise, phases, framework, steps, CTQ and Kano, QFD, display of advanced tools (sigma score prediction, DOE, robust designs, Weibull, reliability testing, reliability predictions, design for reliability, taguchi

## **Module 45      Training Plans**

Who to complete, when/what/how..., training plan form, cross training matrix, training within industry – relations/instruction/methods, project application

## **Module 46      Control Plans – Advanced**

Defined, who to create, control and reaction plan, considerations – impact/cost/time, solutions, rankings, inputs and outputs, implementing, documenting, monitoring, response, aligning systems and structures, sign off