Green Belt

Section 1 — Six Sigma Foundations & Project Selection

1. History & Evolution of Six Sigma Six Sigma began at Motorola in the 1980s as a disciplined approach to reducing defects and improving quality. Its success spread globally when GE adopted it in the 1990s, showcasing how statistical rigor could drive profitability. Over time, Six Sigma evolved into a universal improvement framework, now often integrated with Lean to balance speed and quality.

2. Six Sigma Framework & Project Selection The Six Sigma framework is built on the DMAIC cycle — Define, Measure, Analyze, Improve, Control. Green Belts apply this structure to medium-scale projects that align with organizational priorities. Project selection is critical: candidates must have measurable impact, be feasible, and support strategic goals. This ensures resources are directed toward initiatives that deliver tangible business value.

3. Project Charter Development A project charter defines scope, objectives, and responsibilities. It includes the problem statement, business case, goals, and timelines. For Green Belts, the charter is a roadmap that prevents scope creep and keeps stakeholders aligned. A well-crafted charter builds clarity and accountability from the outset.

Section 2 — Data & Statistical Foundations

4. Data Types, Scales & Sampling Methods Data can be continuous (measurable values) or discrete (counts). Scales of measurement — nominal, ordinal, interval, and ratio — determine which statistical tools are appropriate. Sampling methods such as random, stratified, and systematic ensure representative datasets. Green Belts must classify data correctly and design unbiased sampling plans to maintain validity.

5. Descriptive Statistics & Graphical Tools Descriptive statistics summarize data using measures like mean, median, and standard deviation. Graphical tools — histograms, box plots, scatter diagrams — reveal patterns and anomalies. These techniques help Green Belts understand process behavior and communicate findings clearly to stakeholders.

6. Probability Distributions Probability distributions model how data behaves. Common types include normal, binomial, and Poisson distributions. Green Belts use these to predict outcomes, assess risks, and validate assumptions. Understanding distributions is essential for hypothesis testing and process capability analysis.

Section 3 — Statistical Analysis

7. Proportion Tests & Mean Tests Proportion tests evaluate categorical data (e.g., defect rates), while mean tests compare averages between groups. Green Belts apply these to confirm whether observed differences are statistically significant. Correct test selection ensures reliable conclusions and prevents misinterpretation.

8. Scatter Diagram, Correlation & Regression Analysis Scatter diagrams visualize relationships between variables. Correlation quantifies strength and direction, while regression predicts outcomes based on inputs. Green Belts use these tools to identify drivers of variation and support evidence-based improvements.

Section 4 — Measurement & Process Capability

9. Measurement System Analysis — MSA & Gage R&R MSA evaluates whether measurement systems are reliable. Gage R&R studies separate variation caused by equipment (repeatability) and operators (reproducibility). Green Belts conduct these analyses to ensure data integrity, preventing false conclusions and wasted effort.

10. Process Capability — Cp, Cpk, Pp & Ppk Process capability indices measure how well a process meets specifications. Cp and Cpk assess short-term capability, while Pp and Ppk evaluate long-term performance. Green Belts use these metrics to quantify process stability and identify improvement opportunities.

Section 5 — Process Control & Sustenance

11. Control Charts — X-bar, R, p, np, c & u Control charts monitor process stability using statistical limits. X-bar and R charts track continuous data, while p, np, c, and u charts handle attribute data. Green Belts apply these charts to detect variation early and maintain consistent performance.

12. Process Control & Sustenance Process control ensures outputs remain within specifications, while sustenance embeds improvements into daily routines. Green Belts champion sustainment by documenting methods, training teams, and reinforcing discipline. Long-term success depends on cultural adoption and continuous monitoring.

Section 6 — Root Cause & Lean Improvement

13. Root Cause Analysis — 5 Whys & FMEA The 5 Whys technique drills down to underlying causes, while FMEA systematically evaluates potential failures and their impacts. Green Belts use these tools to move beyond symptoms, prioritize risks, and design preventive actions. This strengthens reliability and customer satisfaction.

14. Lean Tools — VSM, 5S & Kanban Value Stream Mapping visualizes material and information flow, highlighting waste. 5S organizes workplaces for efficiency, while Kanban manages workflow visually. Green Belts apply these Lean tools to streamline processes, reduce lead time, and enhance transparency.

Section 7 — Leadership & Sustaining Improvements

15. Change Management & Project Leadership Basics Change management prepares organizations for new ways of working. Green Belts learn to communicate effectively, manage resistance, and build stakeholder buy-in. Leadership basics include guiding teams, setting expectations, and maintaining momentum throughout projects.

16. Control Plans & Sustaining Improvements Control plans document monitoring methods, responsibilities, and escalation paths. Green Belts implement these to embed improvements into daily operations. Sustaining gains requires discipline, accountability, and continuous reinforcement to prevent regression

Tools used

Section 1 — Six Sigma Foundations & Project Selection

- **History & Evolution of Six Sigma**
    - **Motorola origins, GE adoption, integration with Lean**
- **Six Sigma Framework & Project Selection**
    - **DMAIC cycle (Define–Measure–Analyze–Improve–Control)**
    - **Project selection matrix, business case analysis**
- **Project Charter Development**
    - **Problem statement, scope, goals, timeline, roles**

Section 2 — Data & Statistical Foundations

- **Data Types, Scales & Sampling Methods**
    - **Continuous vs. discrete data**
    - **Nominal, ordinal, interval, ratio scales**
    - **Random, stratified, systematic sampling**
- **Descriptive Statistics & Graphical Tools**
    - **Mean, median, mode, standard deviation**
    - **Histograms, box plots, scatter diagrams**
- **Probability Distributions**
    - **Normal distribution**

    - **Binomial distribution**
    - **Poisson distribution**

Section 3 — Statistical Analysis

- **Proportion Tests & Mean Tests**
    - **One-sample and two-sample proportion tests**
    - **One-sample and two-sample t-tests**
- **Scatter Diagram, Correlation & Regression Analysis**
    - **Scatter plots for visualization**
    - **Pearson correlation coefficient**
    - **Simple linear regression**

Section 4 — Measurement & Process Capability

- **Measurement System Analysis — MSA & Gage R&R**
    - **Repeatability (equipment variation)**
    - **Reproducibility (operator variation)**
- **Process Capability — Cp, Cpk, Pp & Ppk**
    - **Cp: potential capability**
    - **Cpk: actual capability (centeredness)**
    - **Pp/Ppk: long-term performance indices**

Section 5 — Process Control & Sustenance

- **Control Charts — X-bar, R, p, np, c & u**
    - **X-bar & R charts (continuous data)**
    - **p & np charts (proportion/attribute data)**
    - **c & u charts (count data)**
- **Process Control & Sustenance**

    - **Standard operating procedures (SOPs)**
    - **Monitoring plans, escalation paths**
    - **Training and documentation for sustainment**

Section 6 — Root Cause & Lean Improvement

- **Root Cause Analysis — 5 Whys & FMEA**
    - **5 Whys technique for drilling down causes**
    - **FMEA: Failure Modes, Effects, and RPN scoring**
- **Lean Tools — VSM, 5S & Kanban**
    - **Value Stream Mapping (flow visualization)**
    - **5S (Sort, Set, Shine, Standardize, Sustain)**
    - **Kanban boards for workflow management**

Section 7 — Leadership & Sustaining Improvements

- **Change Management & Project Leadership Basics**
    - **Stakeholder analysis, communication plans**
    - **Resistance management, leadership roles**
- **Control Plans & Sustaining Improvements**
    - **Control plan templates (metrics, responsibilities)**
    - **Continuous monitoring and feedback loops**
    - **Embedding improvements into daily routines**

.

GREEN BELT

7 Sections | 16 Lessons

Section 1 — Six Sigma Foundations & Project Selection

1. History & Evolution of Six Sigma
2. Six Sigma Framework & Project Selection
3. Project Charter Development

Section 2 — Data & Statistical Foundations

4. Data Types, Scales & Sampling Methods
5. Descriptive Statistics & Graphical Tools
6. Probability Distributions

Section 3 — Statistical Analysis

7. Proportion Tests & Mean Tests
8. Scatter Diagram, Correlation & Regression Analysis

Section 4 — Measurement & Process Capability

9. Measurement System Analysis — MSA & Gage R&R
10. Process Capability — Cp, Cpk, Pp & Ppk

Section 5 — Process Control & Sustenance

11. Control Charts — X-bar, R, p, np, c & u
12. Process Control & Sustenance

Section 6 — Root Cause & Lean Improvement

13. Root Cause Analysis — 5 Whys & FMEA
14. Lean Tools — VSM, 5S & Kanban

Section 7 — Leadership & Sustaining Improvements

15. Change Management & Project Leadership Basics
16. Control Plans & Sustaining Improvements

Total: 16 lessons

Theory Lessons

Section 1 — Introduction to Six Sigma

1. History & Evolution of Six Sigma Six Sigma originated at Motorola in the 1980s as a quality improvement methodology focused on reducing defects. It gained prominence when General Electric adopted it under Jack Welch, demonstrating its impact on profitability and customer satisfaction.

Over time, Six Sigma evolved into a global standard for process excellence. Today, it integrates with Lean principles, making it a versatile framework for both manufacturing and service industries.

2. DMAIC Framework Overview DMAIC — Define, Measure, Analyze, Improve, Control — is the backbone of Six Sigma projects. Each phase provides a structured approach to problem-solving and improvement.

Green Belts use DMAIC to guide projects step by step, ensuring clarity, data-driven analysis, and sustainable solutions. It instills discipline and consistency across diverse improvement initiatives.

3. Roles of Green Belts in Organizations Green Belts act as project leaders for medium-scale improvements. They balance statistical analysis with practical problem-solving, often working under Black Belt mentorship.

Their role includes data collection, analysis, and implementing solutions within their departments. By bridging frontline operations and leadership, Green Belts drive measurable change at the functional level.

Section 2 — Problem Definition & Project Selection

4. Identifying Business Problems Effective projects begin with identifying problems that impact cost, quality, or customer satisfaction. Green Belts learn to distinguish between symptoms and root issues.

This skill ensures projects are relevant and impactful. By focusing on business priorities, Green Belts maximize organizational value from their efforts.

5. Project Selection Criteria Not all problems qualify for Six Sigma projects. Selection criteria include financial impact, feasibility, and alignment with strategic goals.

Green Belts apply these criteria to avoid wasted effort. Proper selection ensures resources are invested in projects with measurable benefits.

6. Project Charter Basics A project charter defines scope, objectives, and responsibilities. It sets boundaries and expectations for all stakeholders.

Green Belts use charters to maintain focus and prevent scope creep. A well-crafted charter builds alignment and accountability from the start.

Section 3 — Data Collection & Basic Statistics

7. Types of Data (Continuous vs. Discrete) Data can be continuous (measurable values like time or weight) or discrete (countable items like defects). Recognizing the type guides correct statistical methods.

Green Belts classify data accurately to avoid errors in analysis. This foundational skill ensures valid conclusions and reliable improvements.

8. Descriptive Statistics & Visualization Descriptive statistics summarize data through measures like mean, median, and standard deviation. Visualization tools such as histograms and scatter plots reveal patterns.

Green Belts use these techniques to understand process behavior. Clear summaries and visuals make data accessible to stakeholders.

9. Sampling Methods & Bias Reduction Sampling allows analysis without measuring entire populations. Methods include random, stratified, and systematic sampling.

Green Belts design sampling plans to minimize bias. Proper sampling ensures representative data and trustworthy results.

Section 4 — Process Mapping & Analysis

10. SIPOC Diagrams SIPOC diagrams outline Suppliers, Inputs, Process, Outputs, and Customers. They provide a high-level view of process boundaries.

Green Belts use SIPOC to clarify scope and stakeholder relationships. It ensures alignment before diving into detailed analysis.

11. Flowcharts & Swimlane Diagrams Flowcharts depict process steps, while swimlane diagrams show responsibilities across functions. Both highlight inefficiencies and redundancies.

Green Belts apply these tools to visualize workflows. They reveal bottlenecks and opportunities for streamlining.

12. Identifying Process Gaps Gap analysis compares current performance against desired standards. It highlights areas needing improvement.

Green Belts conduct gap analysis to prioritize interventions. This ensures projects target the most critical performance shortfalls.

Section 5 — Measurement System Basics

13. Introduction to Measurement System Analysis Measurement System Analysis (MSA) evaluates reliability of data collection tools. It ensures measurements reflect true process performance.

Green Belts learn MSA basics to validate data integrity. Reliable systems prevent misleading conclusions and wasted effort.

14. Gage R&R Fundamentals Gage R&R studies assess repeatability (equipment consistency) and reproducibility (operator consistency).

Green Belts conduct simple Gage R&R to confirm measurement accuracy. This builds confidence in data used for decision-making.

15. Attribute Agreement Basics Attribute Agreement Analysis checks consistency in categorical data judgments, such as pass/fail inspections.

Green Belts apply AAA to validate inspection processes. Strong agreement reduces misclassification and improves quality control.

Section 6 — Basic Statistical Tools

16. Hypothesis Testing Fundamentals Hypothesis testing evaluates assumptions about data. Common tests include t-tests and chi-square tests.

Green Belts use hypothesis testing to confirm improvements statistically. It ensures changes are not due to random variation.

17. Correlation & Simple Regression Correlation measures relationships between variables, while regression predicts outcomes based on inputs.

Green Belts apply these tools to identify drivers of variation. They support evidence-based improvement strategies.

18. Introduction to ANOVA ANOVA compares means across multiple groups to detect significant differences.

Green Belts use ANOVA to identify factors influencing outcomes. This guides targeted process adjustments.

Section 7 — Root Cause & Improvement Tools

19. Fishbone Diagram & 5 Whys Fishbone diagrams categorize potential causes, while 5 Whys drill down to root issues.

Green Belts use these tools to move beyond symptoms. They ensure solutions address fundamental problems.

20. Brainstorming & Prioritization Tools Brainstorming generates ideas, while prioritization matrices rank them by impact and feasibility.

Green Belts facilitate structured brainstorming sessions. Prioritization ensures resources focus on the most effective solutions.

21. Poka-Yoke Basics Poka-Yoke involves mistake-proofing processes through simple design features. Examples include checklists and visual cues.

Green Belts implement Poka-Yoke to reduce errors. It strengthens reliability and customer satisfaction.

Section 8 — Lean Concepts for Green Belts

22. Introduction to Lean & Waste Elimination Lean focuses on eliminating waste to improve efficiency. The eight wastes include defects, waiting, and overproduction.

Green Belts apply Lean principles to streamline processes. Waste elimination enhances speed and reduces costs.

23. 5S Workplace Organization 5S organizes workplaces through Sort, Set in order, Shine, Standardize, and Sustain.

Green Belts implement 5S to improve discipline and efficiency. A well-organized workplace supports quality and safety.

24. Value Stream Mapping Basics Value Stream Mapping visualizes material and information flow. It highlights delays and non-value-adding steps.

Green Belts use VSM to redesign processes for smoother flow. Improved flow reduces lead time and enhances customer value.

Section 9 — Control & Project Closure

25. Control Charts (Basic Types) Control charts monitor process stability using statistical limits. Basic types include X-bar and p-charts.

Green Belts use control charts to detect variation early. This ensures processes remain consistent after improvements.

26. Sustaining Improvements Sustaining improvements requires embedding changes into daily routines. Documentation and monitoring are key.

Green Belts champion sustainment by training teams and reinforcing discipline. Long-term success depends on cultural adoption.

27. Project Documentation & Closure Project closure involves documenting results, lessons learned, and financial impact. It ensures transparency and accountability.

Green Belts complete closure to hand over improvements to process owners. Celebration of success builds momentum for future projects.

Cases and Lessons Learnt

History & Evolution of Six Sigma 📌 *Case*: Motorola reduced defects in pager production using Six Sigma, saving millions. GE later applied it to billing accuracy, showing its financial impact. 🎯 *Lesson*: Six Sigma's evolution demonstrates how statistical rigor drives both quality and profitability.

DMAIC Framework Overview 📌 *Case*: A call center used DMAIC to cut average call handling time. Define = long calls, Measure = duration data, Analyze = root causes, Improve = new scripts, Control = dashboards. 🎯 *Lesson*: DMAIC provides a disciplined, repeatable path to improvement.

Roles of Green Belts in Organizations 📌 *Case*: In a hospital, Green Belts mapped patient flow and reduced waiting times by 20%, working under Black Belt guidance. 🎯 *Lesson*: Green Belts bridge frontline staff and leadership, leading departmental projects.

Section 2 — Problem Definition & Project Selection

Identifying Business Problems 📌 *Case*: A factory identified "20% defect rate in packaging" as a measurable business problem. 🎯 *Lesson*: Clear problem definition ensures projects target issues with real impact.

Project Selection Criteria 📌 *Case*: A bank chose to address loan approval delays over minor clerical errors, as delays had higher customer impact. 🎯 *Lesson*: Selection criteria (impact, feasibility, alignment) prevent wasted effort.

Project Charter Basics 📌 *Case*: A logistics project charter defined scope = delivery process, goal = reduce late deliveries by 30%, roles = supervisor, analyst, driver. 🎯 *Lesson*: Charters align stakeholders and prevent scope creep.

Section 3 — Data Collection & Basic Statistics

Types of Data (Continuous vs. Discrete) 📌 *Case*: Measuring call duration (continuous) vs. counting dropped calls (discrete) in a call center. 🎯 *Lesson*: Correct classification ensures valid analysis.

Descriptive Statistics & Visualization 📌 *Case*: A histogram of defect counts revealed clustering at one machine. 🎯 *Lesson*: Visualization makes patterns clear and actionable.

Sampling Methods & Bias Reduction 📌 *Case*: A customer survey used stratified sampling across regions to avoid bias. 🎯 *Lesson*: Proper sampling ensures representative data.

Section 4 — Process Mapping & Analysis

SIPOC Diagrams 📌 *Case*: Loan approval SIPOC showed bottleneck at document verification. 🎯 *Lesson*: SIPOC clarifies boundaries and stakeholders.

Flowcharts & Swimlane Diagrams 📌 *Case*: University registration swimlane revealed delays between finance and academics. 🎯 *Lesson*: Swimlanes expose cross-department inefficiencies.

Identifying Process Gaps 📌 *Case*: Delivery process gap analysis showed 95% on-time vs. target 99%. 🎯 *Lesson*: Gap analysis prioritizes interventions.

Section 5 — Measurement System Basics

Introduction to Measurement System Analysis 📌 *Case*: A lab verified instruments gave consistent readings before analyzing samples. 🎯 *Lesson*: Reliable measurement systems prevent false conclusions.

Gage R&R Fundamentals 📌 *Case*: A factory tested whether inspectors classified defects consistently. 🎯 *Lesson*: Gage R&R builds confidence in data accuracy.

Attribute Agreement Basics 📌 *Case*: Three inspectors rated product quality; AAA showed 85% agreement, prompting training. 🎯 *Lesson*: Attribute agreement validates categorical judgments.

Section 6 — Basic Statistical Tools

Hypothesis Testing Fundamentals 📌 *Case*: A company tested if defect rate differed between two shifts using a t-test. 🎯 *Lesson*: Hypothesis testing confirms improvements statistically.

Correlation & Simple Regression 📌 *Case*: Regression showed temperature strongly affected defect rate in molding. 🎯 *Lesson*: Regression identifies drivers of variation.

Introduction to ANOVA 📌 *Case*: ANOVA revealed significant yield differences across three production lines. 🎯 *Lesson*: ANOVA guides targeted adjustments.

Section 7 — Root Cause & Improvement Tools

Fishbone Diagram & 5 Whys 📌 *Case*: Delivery delays traced to "truck breakdowns" → Why? → No preventive maintenance. 🎯 *Lesson*: Root cause tools move beyond symptoms.

Brainstorming & Prioritization Tools 📌 *Case*: Team brainstormed 10 solutions; prioritization matrix selected "automated scheduling" first. 🎯 *Lesson*: Prioritization ensures resources focus on high-impact solutions.

Poka-Yoke Basics 📌 *Case*: USB plugs designed to fit only one way prevent user error. 🎯 *Lesson*: Mistake-proofing strengthens reliability.

Section 8 — Lean Concepts for Green Belts

Introduction to Lean & Waste Elimination 📌 *Case*: Warehouse reorganized layout to reduce motion waste. 🎯 *Lesson*: Lean eliminates non-value-adding activities.

5S Workplace Organization 📌 *Case*: Office applied 5S to organize files, reducing search time. 🎯 *Lesson*: 5S improves discipline and efficiency.

Value Stream Mapping Basics 📌 *Case*: VSM of order fulfillment showed delays in approval stage. 🎯 *Lesson*: VSM highlights waste and redesign opportunities.

Section 9 — Control & Project Closure

Control Charts (Basic Types) 📌 *Case*: X-bar chart detected variation in daily production output. 🎯 *Lesson*: Control charts monitor stability and prevent drift.

Sustaining Improvements 📌 *Case*: Factory sustained reduced defects by training staff and auditing monthly. 🎯 *Lesson*: Sustaining requires embedding changes into routines.

Project Documentation & Closure 📌 *Case*: Closure report showed $200K savings from improved packaging process. 🎯 *Lesson*: Documentation ensures transparency and builds momentum.

Definition-Example-Outcome

Section 1 — Introduction to Six Sigma

History & Evolution of Six Sigma

- *Definition*: Six Sigma began at Motorola in the 1980s to reduce defects, later popularized by GE in the 1990s.
- *Tool/Example*: Case study — GE applied Six Sigma to reduce billing errors, saving millions annually.

- *Outcome*: Demonstrates how statistical rigor drives profitability and customer satisfaction.

DMAIC Framework Overview

- *Definition*: DMAIC = Define, Measure, Analyze, Improve, Control — the structured problem-solving cycle.
- *Tool/Example*: A call center project used DMAIC to cut average call handling time by 20%.
- *Outcome*: Shows how DMAIC provides discipline and repeatability in improvement.

Roles of Green Belts in Organizations

- *Definition*: Green Belts lead departmental projects, collect/analyze data, and support Black Belts.
- *Tool/Example*: In a hospital, Green Belts mapped patient flow and reduced waiting times.
- *Outcome*: Highlights their role as "bridge" between frontline staff and leadership.

Section 2 — Problem Definition & Project Selection

Identifying Business Problems

- *Definition*: Problems must be measurable, relevant, and tied to customer or financial impact.
- *Example*: A factory identifies "20% defect rate in packaging" as a business problem.

Project Selection Criteria

- *Definition*: Criteria include impact, feasibility, alignment with strategy, and data availability.
- *Example*: A bank selects loan approval delays over minor clerical errors because of higher customer impact.

Project Charter Basics

- *Definition*: Charter defines scope, objectives, roles, and timelines.
- *Example*: Charter for a logistics project: scope = delivery process, goal = reduce late deliveries by 30%, roles = supervisor, analyst, driver.

Section 3 — Data Collection & Basic Statistics

Types of Data (Continuous vs. Discrete)

- *Definition*: Continuous = measurable values (time, weight); Discrete = counts (defects, items).
- *Example*: Measuring call duration (continuous) vs. counting number of dropped calls (discrete).

Descriptive Statistics & Visualization

- *Definition*: Summarize data with mean, median, standard deviation; visualize with histograms, scatter plots.
- *Example*: A histogram of defect counts shows clustering at one machine.

Sampling Methods & Bias Reduction

- *Definition*: Random, stratified, and systematic sampling ensure representative data.
- *Example*: A survey of customer satisfaction uses stratified sampling across regions to avoid bias.

Section 4 — Process Mapping & Analysis

SIPOC Diagrams

- *Definition*: High-level map of Suppliers, Inputs, Process, Outputs, Customers.
- *Example*: Loan approval SIPOC shows bottleneck at document verification.

Flowcharts & Swimlane Diagrams

- *Definition*: Flowcharts show steps; swimlanes show responsibilities.
- *Example*: University registration swimlane reveals delays between finance and academics.

Identifying Process Gaps

- *Definition*: Compare current vs. desired performance to find gaps.
- *Example*: Delivery process gap analysis shows 95% on-time vs. target 99%.

Section 5 — Measurement System Basics

Introduction to Measurement System Analysis

- *Definition*: MSA checks reliability of measurement systems.
- *Example*: A lab verifies instruments give consistent readings before analyzing samples.

Gage R&R Fundamentals

- *Definition*: Separates variation from equipment (repeatability) and operators (reproducibility).
- *Example*: A factory tests whether different inspectors classify defects consistently.

Attribute Agreement Basics

- *Definition*: Checks consistency in categorical judgments (pass/fail).
- *Example*: Three inspectors rate product quality; AAA shows 85% agreement, prompting training.

Section 6 — Basic Statistical Tools

Hypothesis Testing Fundamentals

- *Definition*: Tests assumptions about data (e.g., t-test, chi-square).
- *Example*: A company tests if defect rate differs between two shifts.

Correlation & Simple Regression

- *Definition*: Correlation measures relationships; regression predicts outcomes.
- *Example*: Regression shows temperature strongly affects defect rate in moulding.

Introduction to ANOVA

- *Definition*: Compares means across multiple groups.
- *Example*: ANOVA reveals significant difference in yields across three production lines.

Section 7 — Root Cause & Improvement Tools

Fishbone Diagram & 5 Whys

- *Definition*: Fishbone categorizes causes; 5 Whys drills down to root cause.
- *Example*: Delivery delays traced to “truck breakdowns” → Why? → No preventive maintenance.

Brainstorming & Prioritization Tools

- *Definition*: Generate ideas, then rank by impact/effort.
- *Example*: Team brainstorms 10 solutions; prioritization matrix selects “automated scheduling” first.

Poka-Yoke Basics

- *Definition*: Mistake-proofing through design.
- *Example*: USB plugs designed to fit only one way prevent user error.

Section 8 — Lean Concepts for Green Belts

Introduction to Lean & Waste Elimination

- *Definition*: Lean removes non-value-adding activities.
- *Example*: Warehouse reduces motion waste by reorganizing layout.

5S Workplace Organization

- *Definition*: Sort, Set in order, Shine, Standardize, Sustain.
- *Example*: Office applies 5S to organize files, reducing search time.

Value Stream Mapping Basics

- *Definition*: Visualizes material/information flow to highlight waste.
- *Example*: VSM of order fulfilment shows delays in approval stage.

Section 9 — Control & Project Closure

Control Charts (Basic Types)

- *Definition*: Charts monitor process stability (X-bar, p-chart, etc.).
- *Example*: X-bar chart detects variation in daily production output.

Sustaining Improvements

- *Definition*: Embed changes into daily routines with SOPs and monitoring.
- *Example*: Factory sustains reduced defects by training staff and auditing monthly.

Project Documentation & Closure

- *Definition*: Record results, lessons learned, and financial impact.
- *Example*: Closure report shows $200K savings from improved packaging process.

Case Studies

Section 1 — Introduction to Six Sigma

History & Evolution of Six Sigma 📌 *Case*: Motorola reduced defects in pager production using Six Sigma, saving millions. GE later applied it to billing accuracy, showing its financial impact. 🎯 *Lesson*: Six Sigma's

evolution demonstrates how statistical rigor drives both quality and profitability.

DMAIC Framework Overview 📌 *Case*: A call center used DMAIC to cut average call handling time. Define = long calls, Measure = duration data, Analyze = root causes, Improve = new scripts, Control = dashboards. 🎯 *Lesson*: DMAIC provides a disciplined, repeatable path to improvement.

Roles of Green Belts in Organizations 📌 *Case*: In a hospital, Green Belts mapped patient flow and reduced waiting times by 20%, working under Black Belt guidance. 🎯 *Lesson*: Green Belts bridge frontline staff and leadership, leading departmental projects.

Section 2 — Problem Definition & Project Selection

Identifying Business Problems 📌 *Case*: A factory identified "20% defect rate in packaging" as a measurable business problem. 🎯 *Lesson*: Clear problem definition ensures projects target issues with real impact.

Project Selection Criteria 📌 *Case*: A bank chose to address loan approval delays over minor clerical errors, as delays had higher customer impact. 🎯 *Lesson*: Selection criteria (impact, feasibility, alignment) prevent wasted effort.

Project Charter Basics 📌 *Case*: A logistics project charter defined scope = delivery process, goal = reduce late deliveries by 30%, roles = supervisor, analyst, driver. 🎯 *Lesson*: Charters align stakeholders and prevent scope creep.

Section 3 — Data Collection & Basic Statistics

Types of Data (Continuous vs. Discrete) 📌 *Case*: Measuring call duration (continuous) vs. counting dropped calls (discrete) in a call center. 🎯 *Lesson*: Correct classification ensures valid analysis.

Descriptive Statistics & Visualization 📌 *Case*: A histogram of defect counts revealed clustering at one machine. 🎯 *Lesson*: Visualization makes patterns clear and actionable.

Sampling Methods & Bias Reduction 📌 *Case*: A customer survey used stratified sampling across regions to avoid bias. 🎯 *Lesson*: Proper sampling ensures representative data.

Section 4 — Process Mapping & Analysis

SIPOC Diagrams 📌 *Case*: Loan approval SIPOC showed bottleneck at document verification. 🎯 *Lesson*: SIPOC clarifies boundaries and stakeholders.

Flowcharts & Swimlane Diagrams 📌 *Case*: University registration swimlane revealed delays between finance and academics. 🎯 *Lesson*: Swimlanes expose cross-department inefficiencies.

Identifying Process Gaps 📌 *Case*: Delivery process gap analysis showed 95% on-time vs. target 99%. 🎯 *Lesson*: Gap analysis prioritizes interventions.

Section 5 — Measurement System Basics

Introduction to Measurement System Analysis 📌 *Case*: A lab verified instruments gave consistent readings before analyzing samples. 🎯 *Lesson*: Reliable measurement systems prevent false conclusions.

Gage R&R Fundamentals 📌 *Case*: A factory tested whether inspectors classified defects consistently. 🎯 *Lesson*: Gage R&R builds confidence in data accuracy.

Attribute Agreement Basics 📌 *Case*: Three inspectors rated product quality; AAA showed 85% agreement, prompting training. 🎯 *Lesson*: Attribute agreement validates categorical judgments.

Section 6 — Basic Statistical Tools

Hypothesis Testing Fundamentals 📌 *Case*: A company tested if defect rate differed between two shifts using a t-test. 🎯 *Lesson*: Hypothesis testing confirms improvements statistically.

Correlation & Simple Regression 📌 *Case*: Regression showed temperature strongly affected defect rate in molding. 🎯 *Lesson*: Regression identifies drivers of variation.

Introduction to ANOVA 📌 *Case*: ANOVA revealed significant yield differences across three production lines. 🎯 *Lesson*: ANOVA guides targeted adjustments.

Section 7 — Root Cause & Improvement Tools

Fishbone Diagram & 5 Whys 📌 *Case*: Delivery delays traced to "truck breakdowns" → Why? → No preventive maintenance. 🎯 *Lesson*: Root cause tools move beyond symptoms.

Brainstorming & Prioritization Tools 📌 *Case*: Team brainstormed 10 solutions; prioritization matrix selected "automated scheduling" first. 🎯 *Lesson*: Prioritization ensures resources focus on high-impact solutions.

Poka-Yoke Basics 📌 *Case*: USB plugs designed to fit only one way prevent user error. 🎯 *Lesson*: Mistake-proofing strengthens reliability.

Section 8 — Lean Concepts for Green Belts

Introduction to Lean & Waste Elimination 📌 *Case*: Warehouse reorganized layout to reduce motion waste. 🎯 *Lesson*: Lean eliminates non-value-adding activities.

5S Workplace Organization 📌 *Case*: Office applied 5S to organize files, reducing search time. 🎯 *Lesson*: 5S improves discipline and efficiency.

Value Stream Mapping Basics 📌 *Case*: VSM of order fulfillment showed delays in approval stage. 🎯 *Lesson*: VSM highlights waste and redesign opportunities.

Section 9 — Control & Project Closure

Control Charts (Basic Types) 📌 *Case*: X-bar chart detected variation in daily production output. 🎯 *Lesson*: Control charts monitor stability and prevent drift.

Sustaining Improvements 📌 *Case*: Factory sustained reduced defects by training staff and auditing monthly. 🎯 *Lesson*: Sustaining requires embedding changes into routines.

Project Documentation & Closure 📌 *Case*: Closure report showed $200K savings from improved packaging process. 🎯 *Lesson*: Documentation ensures transparency and builds momentum.