



SIX SIGMA

PROF. JITESH J. THAKKAR

Department of Management Studies
IIT Kharagpur

PRE-REQUISITES : Statistics

INTENDED AUDIENCE : Mechanical Engineering, MBA, Industrial Engineering

INDUSTRIES APPLICABLE TO : Manufacturing and Service Industry

COURSE OUTLINE :

- The course on Six-Sigma will focus on detailed strategic and operational issues of process improvement and variation reduction. Six-sigma is a measure of quality that strives for near perfection. It is a disciplined, data-driven approach for eliminating defects (driving towards six standard deviations between the mean and the nearest specification limit) in any process-from manufacturing to transactional and from product to service.
- A Six-sigma defect is anything outside of customer specifications. To be tagged Six Sigma, a process must not produce more than 3.4 defects per million opportunities.
- Six-sigma employs a systematic approach of DMAIC (Define, Measure, Analyze, Improve and Control) for the process improvement. This course will provide a detailed understanding on various issues specific to each phase of DMAIC.
- The course is designed with a practical orientation and includes cases, industry examples and MINITAB software applications.
- The course is designed to satisfy the need of both industry professionals and University students.
- The content is beneficial to both manufacturing and service industry.

ABOUT INSTRUCTOR :

Prof. Jitesh J. Thakkar is a Professor and Director of MBA, BBA & BSc programs at National Rail and Transportation Institute (NRTI), Vadodara – India's first University dedicated in the field of Rail and Transportation education. He has served as a faculty at Department of Industrial and Systems Engineering, IIT Kharagpur for 10 years. He has professional experience of more than 20 years. He holds a Ph.D in Supply Chain Management from IIT Delhi, M.Tech. in Industrial Engineering from IIT Delhi and Bachelors of Engineering in Mechanical Engineering conferred with Gold Medal from one of the oldest Government Engineering College - Birla Vishvakarma Mahavidyalaya Engineering College, Sardar Patel University. His areas of interests include Transportation Management, Logistics and Supply Chain Management, Project Management, Service Operations Management, Six Sigma, Lean Manufacturing, Optimization, Statistical Modeling and System Dynamics. He has supervised 10 Ph.D and 80 B.Tech./M.Tech. projects at IIT Kharagpur. He is a productive researcher with H-index 28 and 75 research papers published in SCI/SCOPUS listed journals. The research papers are published in high impact factor, A* & A grade journals of ABDC (Australian Business Deans Council) such as International Journal of Production Economics, Transportation Research (Part-E), International Journal of Production Research, Computers and Industrial Engineering, Production Planning and Control, Expert Systems with Applications, Journal of Cleaner Production. He has published three books – Structural Equation Modeling, Multi-Criteria Decision Making and Project Management with Springer. He is contributing as Associate Editor of the journals – i) International Journal of Productivity and Performance Management, Emerald and ii) OPSEARCH, Springer. He has executed number of large scale research and consultancy projects sponsored by DST, DRDO, NLC, ICSSR, and MHRD. He has extended training/consulting to various organizations such as L&T, DRDO, Food Corporation of India, Neyveli Lignite Corporation, Tata Steel, Tata Hitachi, Essar Steel, Ordnance Factory, Lakshmi Machine Works Ltd., Godrej, Qatar Chemical. His online course on "Six Sigma" offered by NPTEL has been attended by more than 20,000 University students and Industry professionals in last five years. He has delivered more than 100 invited sessions at various reputed platforms. He has been invited as a faculty expert by IIT Kanpur, IIT Madras, IIM Indore, NITIE Mumbai, NIT Surat, NIT Trichy, IRMA, AMA, BCCI Kolkata, L&T-PMI.

COURSE PLAN:

Week 1 : QUALITY: FUNDAMENTALS AND KEY CONCEPTS

Lecture 1: Brief overview of the course

Lecture 2: Quality concepts and definition

Lecture 3: History of continuous improvement

Lecture 4: Six Sigma Principles and Focus Areas (Part 1)

Lecture 5: Six Sigma Principles and Focus Areas (Part 2)

Lecture 6: Six Sigma Applications

Week 2 : QUALITY: FUNDAMENTALS AND KEY CONCEPTS

Lecture 7: Quality Management: Basics and Key Concepts

Lecture 8: Fundamentals of Total Quality Management

Lecture 9: Cost of quality

Lecture 10: Voice of customer

Lecture 11: Quality Function Deployment (QFD)

Lecture 12: Management and Planning Tools (Part 1)

Lecture 13: Management and Planning Tools (Part 2)

Week 3 : DEFINE

Lecture 14: Six Sigma Project Identification, Selection and Definition

Lecture 15: Project Charter and Monitoring

Lecture 16: Process characteristics and analysis

Lecture 17: Process Mapping: SIPOC

Week 4 : MEASURE

Lecture 18: Data Collection and Summarization (Part 1)

Lecture 19: Data Collection and Summarization (Part 2)

Lecture 20: Measurement systems: Fundamentals

Lecture 21: Measurement systems analysis: Gage R&R study

Lecture 22: Fundamentals of statistics

Lecture 23: Probability theory

Week 5 : MEASURE

Lecture 24: Process capability analysis: Key Concepts

Lecture 25: Process capability analysis: Measures and Indices

Lecture 26: Process capability analysis: Minitab Application

Lecture 27: Non-normal process capability analysis

Week 6 : ANALYZE

Lecture 28: Hypothesis testing: Fundamentals

Lecture 29: Hypothesis Testing: Single Population Test

Lecture 30: Hypothesis Testing: Two Population Test

Lecture 31: Hypothesis Testing: Two Population: Minitab Application

Lecture 32: Correlation and Regression Analysis

Lecture 33: Regression Analysis: Model Validation

Week 7 : ANALYZE

Lecture 34: One-Way ANOVA

Lecture 35: Two-Way ANOVA

Lecture 36: Multi-vari Analysis

Lecture 37: Failure Mode Effect Analysis (FMEA)

Week 8 : IMPROVE

Lecture 38: Introduction to Design of Experiment

Lecture 39: Randomized Block Design

Lecture 40: Randomized Block Design: Minitab Application

Lecture 41: Factorial Design

Lecture 42: Factorial Design: Minitab Application

Week 9 : IMPROVE

Lecture 43: Fractional Factorial Design

Lecture 44: Fractional Factorial Design: Minitab Application

Lecture 45: Taguchi Method: Key Concepts

Lecture 46: Taguchi Method: Illustrative Application

Week 10 : CONTROL

Lecture 47: Seven QC Tools

Lecture 48: Statistical Process Control: Key Concepts

Lecture 49: Statistical Process Control: Control Charts for Variables

Lecture 50: Operating Characteristic (OC) Curve for Variable Control charts

Lecture 51: Statistical Process Control: Control Charts for Attributes

Lecture 52: Operating Characteristic (OC) Curve for Attribute Control charts

Lecture 53: Statistical Process Control: Minitab Application

Week 11 : CONTROL

Lecture 54: Acceptance Sampling: Key Concepts

Lecture 55: Design of Acceptance Sampling Plans for Attributes (Part 1)

Lecture 56: Design of Acceptance Sampling Plans for Attributes (Part 2)

Lecture 57: Design of Acceptance Sampling Plans for Variables

Lecture 58: Acceptance Sampling: Minitab Application

Week 12 : SIX SIGMA IMPLEMENTATION CHALLENGES

Lecture 59: Design for Six Sigma (DFSS): DMADV, DMADOV

Lecture 60: Design for Six Sigma (DFSS): DFX

Lecture 61: Team Management

Lecture 62: Six Sigma: Case study

Lecture 63: Six Sigma: Summary of key concepts