

# Six Sigma - Video course

## COURSE OUTLINE

This course will teach a focused managerial strategy of process improvement and variation reduction called Six Sigma, 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.

To this end this course will span established methods of quality assurance and management, and advanced statistical methods including design of experiments.

Positioned at the frontier of modern quality strategies, Six Sigma comprises two frameworks-DMAIC (define, measure, analyze, improve, control) and DMADV (define, measure, analyze, design, verify). This course will cover both.

### Contents:

Basic concepts in quality management, TQM, Cost of quality, quality engineering and Six Sigma, review of Probability and Statistics, Test of Hypothesis.

DMAIC process for process and design improvement, Acceptance Sampling, SPC (Statistical Process Control), Process Capability, Gage Reproducibility and Repeatability, Quality Function Deployment.

Design of Experiments, ANOVA, EVOP; Fractional, Full and Orthogonal Experiments, Regression model building, Taguchi methods for robust design, Six Sigma sustainability; Case studies.

## COURSE DETAIL

**A video course shall consist of 40 or more lectures with 1 hour duration per lecture.**

Sessions	Contents	Chapter Reference
1,2	<b>Basic concepts</b> in Quality Engineering and Management: definitions, approaches and relevance to organizational excellence.	1, 2 Mitra 1, 3 Pyzdek
3,4	<b>Probability and Statistics</b> -a review.	4 Mitra 2 Montgomery



NP-TEL

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<http://nptel.iitm.ac.in>

## Management

### Pre-requisites:

Engineering and Math courses in undergraduate (B Tech) program.

Preferred Background.

1. Engineering graduate.
2. Some probability and statistics.
3. 2 years Work experience in Service or Manufacturing or Projects is recommended.

### Additional Reading:

1. DMADV.
2. [books.google.com/books?id=06276jjdG3IC&printsec=frontcover#PPA25,M1](https://books.google.com/books?id=06276jjdG3IC&printsec=frontcover#PPA25,M1)

### Hyperlinks:

1. [en.wikipedia.org/wiki/Six\\_Sigma](https://en.wikipedia.org/wiki/Six_Sigma)
2. [www.motorola.com/content.jsp?globalObjectId=3088](http://www.motorola.com/content.jsp?globalObjectId=3088)

### Coordinators:

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5,6	<b>Total Quality Management</b> perspective, methodologies and procedures; Roadmap to <b>TQM</b> , ISO 9000, KAIZEN, Quality Circles, Quality Models for organizational excellence.	1, 2, 3 Mitra
7	<b>Cost of Quality</b> concepts; finding incentives for improving quality.	1 Mitra 4 Pyzdek
8,9	<b>Overview of Project Management.</b>	
10	<b>Measurements</b> , Accuracy, precision, <b>Gage R &amp; R.</b>	6 Pyzdek
11,12	<b>Product quality control:</b> Acceptance sampling methods- single, multiple and sequential sampling plans; Recent developments in inspection methods.	10 Mitra
13,14	<b>SPC:</b> Process evaluation and control by control charts: p, c, u, CUSUM and multivariate charts.	4 Mitra
15	<b>Process capability studies:</b> Various indices and approaches; Discussions on capabilities of Process, Machine and Gauge.	9 Mitra
16,17,18	<b>Six Sigma</b> Concepts, Steps and Tools.	1,3 Pyzdek
19	<b>Quality Function Deployment</b> , QFD example.	3 Mitra 3 Pyzdek
20,21,22	<b>Process</b> evaluation and improvement by <b>Design of Experiments:</b> Various basic designs; Special methods such as EVOP and ROBUST design (Taguchi Methods).	12 Mitra 9 Pyzdek 5, 6 10 Montgomery
23,24	<b>Case Study of Orthogonal Array application.</b>	Bagchi
25,26	<b>Robust design</b> by Taguchi Methods.	Bagchi, Mitra
27	<b>Case Study of product design by Taguchi Philosophy.</b>	Bagchi

28,29,30	<b>DMAIC-Define, measure, analyze, improve and control</b> -the methodology of Six Sigma implementation.	11 Mitra 8 Pyzdek
31,32	<b>DMADV-Define, Measure, Analyze, Design and verify</b> -the methodology for creating high performance designs.	8 Pyzdek
33,34	<b>Justifying Six Sigma: a Manufacturing Case.</b>	Bagchi
35,36,37	<b>Readiness for Six Sigma-assessing the Organization.</b>	CII Questionnaire
38,39	<b>Case Study of initiating Six Sigma DMAIC in Manufacturing.</b>	Bagchi
40	<b>TQM vs. Six Sigma-The contrast.</b>	Pyzdek

**References:**

1. Evans, J R and W M Lindsay (2005). An Introduction to Six Sigma and Process Improvement, CENGAGE.
2. Evans, J R and W M Lindsay (2005). Total Quality: Management, Organization and Strategy, 4th ed, CENGAGE.
3. Pyzdek, Thomas (2005). The Six Sigma Handbook- Revised and Expanded, Quality America Incorporated.
4. Montgomery, D C (2007). Design and Analysis of Experiments, 5th ed., Wiley.
5. Mitra, Amitava (2005). Fundamentals of Quality Control and Improvement, Pearson.