

# GUJARAT TECHNOLOGICAL UNIVERSITY

## MECHANICAL (INDUSTRIAL ENGINEERING) (46)

### QUALITY ENGINEERING AND SIX SIGMA FUNDAMENTALS

**SUBJECT CODE: 2724603**

**SEMESTER: II**

**Type of course:** Core

**Prerequisite:** NA

**Rationale:** The aim of this course is to make students understand and appreciate the importance of quality in the industrial and business systems. Students can develop understanding of quality control and improvement tools and techniques as well as methodology for inbuilt quality. The course is also aimed at making students aware of latest quality improvement methodology, that is, Six Sigma.

**Teaching and Examination Scheme:**

With Effect from January 2015

Teaching Scheme			Credits	Examination Marks				Total Marks		
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	ESE (V)	PA (I)				
				ESE	OEP	PA	RP			
3	2#	0	4	70	30	30	0	10	10	150

**Contents:**

Sr. No.	Topic	Total Hours	% Weightage
1	<b>Introduction:</b> Different Definitions and Dimensions of Quality, Historical Perspective (From Evolution of Quality Control, Assurance and Management to Quality as Business Winning Strategy), Contribution of Renowned Quality Gurus (Their Philosophies and Impact on Quality).	05	10
2	<b>Quality Engineering and Management Tools, Techniques &amp; Standards:</b> <b>(A) Statistical Quality Control:</b> Causes of Variation, Control Charts for Variables (Mean and Range, Mean and Standard Deviation, Cumulative Sum Control Chart), Control Chart Patterns and Corrective Actions, Control Charts for Attributes (p-chart, np-chart, c-chart, u-chart), Acceptance Sampling Plans (Concepts of Producer's and Consumer's Risks, Types of Sampling Plans and their merits and demerits, Operating Characteristic Curve, Average Outgoing Quality Curve), Errors in Making Inferences from Control Charts (Type I and II errors).	10	20
3	<b>Quality Engineering and Management Tools, Techniques &amp; Standards:</b> <b>(B) Quality Control &amp; Improvement Tools:</b> 7 QC tools, 7 New Quality Management Tools, 5S Technique, Kaizen, Poka-Yoke,	10	20

	Quality Circle, Cost of Quality Technique		
4	<b>Quality Engineering and Management Tools, Techniques &amp; Standards:</b> (C) <b>Quality Assurance and Management:</b> ISO:9000, ISO:14000, QS:9000 (Concept, Scope, Implementation Requirements & Barriers, and Benefits), Total Quality Management (Basic Philosophy, Approach, Implementation Requirements & Barriers), Introduction to National and International Quality Awards.	03	10
5	<b>Designing for Quality:</b> Introduction to Concurrent Engineering, Quality Function Deployment (QFD) and Failure Mode and Effect Analysis (FMEA) – Concept, Methodology and Application	06	15
6	<b>Quality in Service Sectors:</b> Characteristics of Service Sectors, Quality Dimensions in Service Sectors, Measuring Quality in Different Service Sectors.	03	10
7	<b>Six Sigma Fundamentals:</b> Basic Concept, Methodology, Process Improvement Model (DMAIC) Steps (Objectives, Tools and Techniques Used), Six Sigma Organization, Six Sigma Implementation Requirements, Introduction to Lean Six Sigma.	08	15

#### Reference Books:

- 1 Fundamentals of Quality Control and Improvement, Amitava Mitra, Prentice – Hall International Edition.
- 2 Juran's Quality Planning & Analysis for Enterprise Quality, Frank M. Gryna, Richard C. H. Chua, Joseph A. Defeo, Tata McGraw Hill Edition.
- 3 Total Quality Management by Dale H. Besterfield, Carol Besterfield-Michna, Glen H. Besterfield and Mary Besterfield-Sacre, Pearson Educaiton.
- 4 The Six Sigma Manual for Small and Medium Businesses, Craig W. Baird, Yes Dee Publishing Pvt. Ltd.
- 5 Managing for Total Quality: N. Logothetis, Prentice Hall of India Pvt. Ltd.
- 6 Statistical Quality Control by Eugene L. Grant and Richard S. Leavenworth, Tata McGraw-Hill Publishing Company Ltd.
- 7 Quality Control & Application by B. L. Hanson & P. M. Ghare, Prentice Hall of India
- 8 Quality Control Handbook, J. M. Juran & F. M. Gryna, Prentice Hall Publications.
- 9 Total Quality Management by K C Arora, S K Kataria & Sons.
- 10 Total Quality Management – Dr. S. Kumar, Laxmi Publication Pvt. Ltd.
- 11 All About Six Sigma, Warren Brussee, Tata McGraw Hill Edition

#### Course Outcome:

After learning the course the students should be able to...

- 1) Understand the concepts of quality control, improvement and management.
- 2) Understand and apply different tools & techniques of quality engineering and management.
- 3) Understand the concept of design for quality.
- 4) Understand and apply the concept and importance of service quality.
- 5) Understand quality management standards.
- 6) Understand the latest quality improvement methodology, that is, Six Sigma.

**List of Tutorials:**

- 1) Analysis of Quality Definition by Renowned Quality Gurus
- 2) Exercise on Control Charts for Variables and Attributes
- 3) Exercise on 7 QC Tools and 7 New Quality Management Tools
- 4) Case Study on QFD
- 5) Case Study on FMEA
- 6) Case Study on Service Quality
- 7) Review and Analysis of Research Papers on Six sigma

**Major Equipments: NA**

**Review Presentation (RP):** The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.