

## **Course- Plan**

**School: Engineering**

**Department: Mechanical Engineering**

**Course code: ME 492**

**Course name: Quality Science and Engineering**

**L-T-P: 3-0-0**

**Course instructor: Monoj Bardalai**

### **1. Abstract:**

Quality Science and Engineering is the course offered by Mechanical Engineering as the interdisciplinary course which is essential for all professional. The subject provides a fundamental and comprehensive coverage of Total Quality Science and Engineering. It covers principles and practices as well as the tools and techniques. It satisfies the instructional needs of business, education, engineering, healthcare and science & technical students in the higher education. The contents of the course serves as the excellent training and reference manual for all sizes and types of organisation-service, manufacturing, government, military, construction, education etc. The course is divided into two parts-Part I covers the principle and practices of Quality Science and Engineering. In this part along with the introduction the concept of leadership, customer satisfaction, employee involvement, continuous process improvement, supplier partnership and performance measures are discussed in details. The part II of the course covers the tool and techniques of Quality Engineering. This include the details discussion of quality systems-ISO 9000 and ISO 14000, benchmarking, quality function deployment, product and system reliability, Taguchi's quality engineering, products liability, failure mode and effects analysis, management tools and Total productive maintenance.

### **Objective:**

The course tries to fulfil the following objectives-

- i) To clarify the concept and principle of Quality Science and Engineering in all types of organisations
- ii) To implement the tools and techniques of quality management in practise for all concern.
- iii) The proper utilisation of the principle, tools, and techniques of the Quality Science and Engineering can help in the development of both the organisation as well as the society.

### **2. Prerequisite of the course: Nil**

### **3. Course out line:**

#### **Part-I**

Principle and practices of Quality engineering

Quality of leadership

Customer satisfaction

Involvement of employee

Continuous process improvement

Supplier Partnership

Performance evaluation

**Part-II**

Statistical process control (SPC)

ISO9000& 14000

Benchmarking

Quality function deployment

Taguchi's quality engineering

Liability of products

Failure mode and effect analysis (FMEA)

Management tools

Total productive maintenance

**4. a) Time plan**

Sl No	Topic	Content details	L	T	P	Total
<b>Part-I</b>						
1	Principle and practices of TQM	Basic definition of quality, new and old culture, dimensions of quality, Deming's philosophy.	1	0	0	1
2	Quality of leadership	Leadership concept and characteristics , quality council, core value and concept, vision and mission statement, strategic planning	2	0	0	2
3	Customer satisfaction	Introduction, customer supplier chain, feedback, translating needs into requirements, customer retention	2	0	0	2
4	Involvement of employee	Maslow's Hierarchy of Needs, Herzberg's Two Factor Theory, Employee wants, Empowerment, characteristics of a successful team, recognition and reward, benefits from employee involvement	2	0	0	2
5	Continuous process improvement	Introduction, Input/ out process model, Juran Trilogy, Plan-Do-Study-Act (PDSA) cycle, Problem solving method.	2	0	0	2
6	Supplier Partnership	Introduction, Supplier selection, principle of customer/supplier relations, supplier selection, rating and certification, Relationship development	2	0	0	2
7	Performance Evaluation	Basic concepts, Quality cost, Cost catagories, Optimum cost, Quality cost analysis, Reporting, Quality improvement strategy, Malcolm Baldrige National Qulaity Award.	3	0	0	3
<b>Part-II</b>						
8	Statistical process control (SPC)	Histogram, Pareto Analysis, Process flow diagram, Cause and effect diagram, check sheet, statistical fundamental, X and R chart, Chart for attributes , scatter diagram	3	0	0	3
9	ISO9000& 14000	Introduction, ISO 9000 series standards, elements of ISO/QS 9000, steps to implement a quality systems, ISO 14000 series standards, concepts	5	0	0	5

		and requirement of ISO 14001, EMS benefits				
10	Benchmarking	Definition, reasons for benchmarking, what to benchmark, planning, studying others, Pitfalls and Criticisms of benchmarking	3	0	0	3
11	Quality function deployment	Introduction, benefits of QFD, the voice of the customer, affinity diagram, Building of a house of quality, QFD process	2	0	0	2
12	Product and system reliability	Definition, stages of failure (bath tub curve), probability distribution function, probability density function, exponential failure rate, hazard rate, reliability function derivation, Weibull distribution, system reliability-series, parallel and combination of series and parallel arrangement, improvement of reliability.	5	0	0	5
13	Taguchi's quality engineering	Taguchi's loss function, step and quadratic function, signal- to- noise (S/N) ratio, Orthogonal Array	3	0	0	3
14	Liability of products	Introduction, product safety law, product liability law, proof and expert witness, financial loss, future of product liability	2	0	0	2
15	Failure mode and effect analysis (FMEA)	Introduction, Reliability and its requirement, failure rate, intent of FMEA, FMEA documentation, Stages of FMEA, Design of FMEA document,	2	0	0	2
15	Management tools	Introduction, forced field analysis, interrelationship digraph, Tree diagram, matrix diagram, Process Decision Program Chart (PDPC), activity network diagram.	3	0	0	3
17	Total productive maintenance	Introduction, Learning the new philosophy, improvement needs, Autonomous work group	2	0	0	2
	Total		44	0	0	44

#### Text book(s):

1. Krishnamoorthi K.S., Krishnamoorthi V.Ram. *Quality Engineering*. CRC press, Taylor and Francis.
2. Besterfield Dale H., Besterfield-Michna C, Besterfield G H, and Besterfield-Sacre M. *Total Quality Management*. Pearson Education Asia, 2002.
3. Besterfield Dale H., *Quality Control*. Prentice Hall Career & Technology Eaglewood Cliff, NJ 07632.
3. Hoang Pham. *Recent Advances in Reliability and Quality Engineering*. World Scientific, 2001.

#### Reference (s):

1. Pyzdek Thomas and Berger Roger W. *Quality Engineering Handbook*. Tata McGraw Hill, 1996.

2. Khanna O.P. and Sarup A. *Industrial Engineering and management: with an appendix introducing ISO 9000 Quality systems*. Dhanpat Rai Publications, 2011

**5. b) Evaluation plan:**

Sl No	Test	Time	Marks	Mode of evaluation	Tentative date of test
1	Test-i	30 min	25	Theoretical written test	
2	Test-ii	30 min	25	Theoretical written test	
3	Major-1	1 Hr	40	Descriptive theoretical written test	
3	Test-iii	--	25	Assignment type/presentation/field work etc.	
4	Test-iv	30 min	25	Theoretical written test	
5	Major-2	2 Hrs	60	Descriptive written examination	
		Total	200		

**1. Pedagogy:**

Lecture and discussion/questioning

Seminars and presentation

Field work

Assignments

Class test and quiz

**2. Expected outcome:**

After successful completion of this course

✓ The students will gather the concept and philosophy of overall quality engineering and management.

✓ The students will be able to know various tools and techniques for control, improvement and performance measures of different quality characteristics.

✓ The learners will understand the benefits of total quality management in any kind of organisations. In the long run, the student as a professional, as well as the organisation will be highly benefited, becoming the leading organisation in nation and world by implementing the various concepts, philosophies, tools and techniques for quality improvement and management.