GUJARAT TECHNOLOGICAL UNIVERSITY

MECHATRONICS ENGINEERING (20)
QUALITY ASSURANCE & RELIABILITY
SUBJECT CODE: 2182003
B.E. 8th SEMESTER

Type of course: Engineering Science

Prerequisite: N.A.

Rationale: Concept of quality in engineering products is explored in this subject. Various aspects of quality such as quality management, statistical quality control, system reliability, etc. will be taught to students.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	0	3	70	20	10	0	0	0	100

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	QUALITY Quality: Definition, History, Importance , Cost of Quality, Approaches of Quality Management, Hierarchy of Quality management: Inspection & Test, Quality Control, Quality Assurance, Total Quality Management	5	12.5
2	Statistical Quality Control SQC tools, Benefits of SQC, Concept of variation, Assignable & Chance causes, Attributes & variables, Frequency distribution curve & its types. Normal Distribution curve, Problems on FD curve & ND curve. Control chart for variable: Definition, Formulae & its problems. Control chart patterns, Process capability. Problems on x & R chart and Process capability. Control chart for attribute: Definition, Formulae & its problems. Problems on p, c charts. Sampling: Definition, types of sampling, importance, benefits and limitations of sampling	10	25
3	QUALITY MANAGEMENT SYSTEMS Quality Assurance (QA): Introduction, Definition, Management principles in QA, Forms of QA, QA in different stages. Quality planning, QA program, QA aspect, Quality in material management, Vendor selection & development. ISO: Introduction, ISO 9000 series of standard, ISO 9001 clauses, Registration process, Benefits of ISO. ISO 9001 clauses, Registration process, Benefits of ISO. Quality survey: Scope, Types of audit, inspection methods, Quality budget, Vendor Quality Rating. Total Quality Management: Definition, Models of TQM, Elements of TQM, Principles of TQM. Deming's approach, PDCA cycle, Juran's approach, JIT, Training for Quality management.	10	25

	Quality Improvement Programme: Histogram, Charts, Brain-storming, Cause & Effect diagram, Pareto analysis. Quality Circle: Quality Circle structure, Its operation, Characteristics of Quality Circle, Basic problem solving techniques. Introduction to Six Sigma and Taguchi concepts.			
4	RELIABILITY CONCEPTS Elements of probability, Reliability engineering fundamentals, Failure data analysis and examples, Failure rate, Failure density, Probability of failure, Mortality rate, Mean time to failure, Reliability in terms of Hazard rate and Failure Density, examples, Useful life and wear out phase of a system, Concept of burn period. Hazard Models, Conditional Probabilities and examples, Multiplication rule and examples, Bayes theorem and examples	**10**	**25**
5	SYSTEM RELIABILITY and IMPROVEMENT Reliability of series and parallel connected systems and examples, Logic diagrams, An r-out of –n structures, Improvement of components, Element Redundancy, Unit redundancy, Standby redundancy	**5**	**12.5**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**20**	**15**	**10**	**5**	**-**

Legends: R : Remembrance ; U = Understanding; A = Application and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table

Reference Books:

1. L.S.Srinath Reliability Engineering Affiliated East West Press
2. Seymour Lipschutz Schaums outline of theory & problems of Probability SI (Metric) Edition 1981. Tata McGraw-Hill Publishing Co. Ltd.
3. M. Mahajan Statistical Quality Control Dhanpat Rai & Co. (P) Ltd.
4. Hopper A. G. Basic Statistical Quality Control Tata McGraw-Hill Publishing Co. Ltd.
5. K.C.Arora Total Quality Management S.K.Kataria & Sons
6. Dale Besterfield, Carol Besterfield, Glen H. Besterfield, Mary Besterfield Total Quality Management Pearson Education Inc., First Indian Reprint 2001.
7. Mohamad Zairi Total Quality Management for Engineers Gulf Publishing Company 1991.
8. Phillip J. Ross Taguchi Techniques for Quality Engineering McGraw Hill Book Co.
9. E Balagurusami Reliability Engineering Tata McGraw Hill
10. David Hoyle ISO9000 Quality Systems Handbook Butterworth-Heinemann Publicatins

Course Outcome:

After learning the course the students should be able to:

1. Made aware about the significance of Quality and hierarchy of Quality Management: Inspection & Test, Quality Control, Quality Assurance and Total Quality Management.
2. Get acquainted with the concepts of Quality Assurance in detail, including Quality Management Systems such as ISO 9000 series of quality standard and its objectives.
3. Learn to use several Quality Improvement Tools like Histogram, charts, Brain Storming exercise, Cause & Effect Diagram & Pareto Diagram. They would also get idea about the concept of Quality

Circles and their functioning. In addition they would get an introduction about taguchi and six sigma.
4. Know about elements of probability and concept of reliability engineering including failure data analysis.

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.