Sankalchand Patel University

Faculty of Engineering and Technology

Second Year Master of Technology - Mechanical Engineering (Production Technology) In **Effect from Academic Year 2022-23**

Branch Name:	Mechanical Engineering (Production Technology)
Semester/Year:	Semester IV / Second Year
Subject Title:	Quality Control and Reliability
Subject Code:	1ET2090403
Pre-requisite:	Zeal to learn Subject

Course Objectives:

The aim of this course is

1. To make students understand and appreciate the importance of quality control and reliability analysis in industrial system.
2. To understand the basic concepts of Quality Circle: its objectives, structure and techniques.
3. To impart the knowledge to the students about various Design of Sampling Plans and Control Charts.
4. To impart the knowledge to the students about T.Q.M., Q.F.D., ISO-9000, Six Sigma and their applications in Manufacturing and Service Sectors.
5. To understand the basic fundamentals of Reliability Engineering and apply them to know about the practical aspects of Industrial World.

Teaching Scheme (Hours per week)				**Evaluation Scheme (Marks)**				
				Theory (Marks)		**Practical (Marks)**		
Lecture (L)	**Tutorial (T)**	**Practical (P)**	**Credit**	**University Assessment**	**Continuous Assessment**	**University Assessment**	**Continuous Assessment**	**Total (Marks)**
03	00	02	05	60	40	30	20	150

Subject Contents			
Sr. No	**Topic**	**Total Hours**	**Weightage (%)**
1	**Introduction:** Concept of Quality, Need, Factor influencing quality, Types of Quality, Quality Control, Cost of Quality Control, Quality Assurance, Benefits, Modern concept, Inspection and Quality Control, Quality Characteristics, Quality Circles	03	10
2	**Statistical Concepts and Control Charts:** Review of fundamental statistical concepts, Frequency distribution, Central tendency, measures of dispersion, Probability distributions, statistical Quality Control, Theory of Control charts, Control charts for variables and attributes (X, R, p, np and C chart), their advantages and disadvantages, Applications.	08	16
3	**Acceptance Sampling:** Introduction, Advantages and Disadvantages, Operating Characteristics curve, Producer's and consumer's risk, Quality indices for Acceptance Sampling plans, Types of Sampling Plans-Single, Double, Multiple and Sequential Sampling plans, Sampling plan for variables, Continuous Sampling plans, Skip lot Sampling plans, Chain Sampling plan.	08	16

4	**Total Quality Management:** Introduction, Concept of Total quality, Quality Function Deployment tools for continuous quality improvement, The ISO 9000 family of standards, Six Sigma and other extensions of TQM.	03	10
5	**Reliability:** Failure rate analysis, mean failure rate, mean time to failure, mean time between failure, Graphical representation of Fd, Z and R. Generalization in graphical form, integral form, Hazard models, systems reliability, availability, maintenance, overall equipment effectiveness, Total Productive Maintenance (TPM). Introduction to Concurrent Engineering, Quality Function Deployment (QFD) and Failure Mode and Effect Analysis (FMEA) – Concept, Methodology and Application.	08	16
6	**Reliability Determination and Prediction:** Reliability Determination Methods: Network reduction technique, Path tracing technique, Decomposition technique, Delta-Star method. Advanced Reliability Evaluation Concepts: Supplementary variables technique, Interference theory, Human reliability, Common cause failures, Fault trees, Failure mode and effect analysis. Reliability Prediction Models: Series and parallel systems - RBD approach - Standby systems - m/n configuration - Application of Baye's theorem - cut and tie set method - Markov analysis - FTA - Limitations.	08	16
7	**Reliability Management:** Reliability testing: Time acceleration factor, influence of acceleration factor in test planning, application to acceleration test, high temperature operating life acceleration model, temperature humidity bias acceleration model, temperature cycle acceleration model, vibration accelerator model, failure free accelerated test planning. Accelerated reliability growth.	08	16
		46	**100**

Review Presentation: The student is expected to spend minimum 2 hours per week (as mentioned in the teaching and evaluation scheme) to refer at least two peer reviewed journal papers related to this domain/subject. The student is expected to identify issues/challenges and emerging trends in the domain/subject. Student is supposed to explore various video lectures (e.g. NPTEL) available in the domain/subject. Student is required to make a review-presentation on the work carried out for the same. Recommended sites for journal papers are (1) asmedigitalcollection.asme.org (2) springer.com (3) sciencedirect.com (5) ieeexplore.ieee.org (6) scholar.google.co.in or others of similar repute.

Course Outcomes:

The student will be able to

1. Understand the fundamentals of Quality
2. Understand basic statistical concepts, decision preparatory of the control charts and applications.
3. Analyse the Process Capability Behaviour
4. Understand the concepts of Acceptance Sampling, Sampling Plans and their applications
5. Understand the Reliability and its relationship with Availability and Maintainability

List of Reference Books:

1. Grant E L, “Statistical Quality Control “, McGraw-Hill.
2. Shrinath L S, “Reliability Engineering” Affiliated East west press.

3. Besterfield D H, “Quality Control”, Prentice Hall.
4. Sharma S C, “Inspection Quality Control and Reliability”, Khanna Publishers.
5. Prabhakar Murthy D N and Marvin R, “Product Reliability”, Springer-Verlag.
6. Dana Crowe and Alec Feinberg, “Design for Reliability”, CRC Press.
7. Reliability Engineering by E. Balagurusamy

List of Practical:

Laboratory/Tutorial work shall be based on the topics above. At least 5-6 practical/tutorial must be designed. Experiments with performance/demonstration facility should be given preference.