

GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: INDUSTRIAL ENGINEERING (15)
SUBJECT NAME: INDUSTRIAL STATISTICS & QUALITY MANAGEMENT
SUBJECT CODE: 2171504
B.E. 7th SEMESTER

Type of course: Department Elective

Prerequisite: No specific pre-requisite. Students should have primary understanding of production management concepts and necessary quantitative background.

Rationale: This subject introduce various statistical quality control tools and techniques including various variable and attribute control charts as well as sampling plans, which are necessary skills for a quality professional. In this course, students will learn about many statistical methods commonly used by industry to monitor and ultimately improve the quality of products resulting from industrial processes. The course will also emphasize on application of these methods.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		ESE (V)		PA (I)		
PA	ALA	ESE		OEP						
4	0	2	6	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weight age
1	Introduction: Meaning and scope of Industrial statistics, common patterns of variations, The normal, binomial and poison distributions and its properties, Elements of Probability as applied to statistics, conditional probability, Bayer's theorem.	6	8
2	Statistics theory : Measures of central tendency – Mean, Median, Mode, Quartile, measures of dispersion - standard deviation, variance, standard deviation of combined group, absolute and relative measures of dispersion, skewness and kurtosis.	6	9
3	Probability theory: Probability distribution of discrete and continuous random variable functions, parameters, probability density functions, Mean, Median, Moment, Moment generating functions of binomial, poison, geometric and hypergeometric distributions, Mathematical expectations.	6	9
4	Tests of significance: Elementary theory and practice of sampling, standard error of means and variance, tests of significance X- test, T-test, F-test, Z-test, and their application. Mathematical expectations.	10	16

5	Regression and correlation: Curve fitting correlation and Regression, elements of statistical inference and estimation theory applied to engineering problems.	4	8
6	Quality: Definition: concepts of quality, total quality and quality control, quality characteristics, economics, policy and objectives, specifications T.Q.M. and various quality standards.	4	6
7	Inspection: Need for inspection, types of inspections, inspection stages-where and how much to inspect, organizing for inspection.	4	6
8	Quality control : Basic objectives, Product effectiveness & quality of design, manufacture and performance, total systems cost, quality assurance, benefits from quality assurance on reliability and quality control, quality control and production relationship in organization structure, statistical quality .	6	10
9	Control charts : General theory, charts for variables and attributes i.e. X R chart, P chart, NP chart and C chart used in process, attributes, process capability charts.	10	16
10	Acceptance sampling: Elementary concept of sampling by attributes, single & double sampling tables, construction and use of O.C. curve, AQL, LTPD, produces risk, consumers risk, AOQL, O C curve specifications, effect of change of sampling, Introduction to sampling by variables, continuous sampling, designing of sampling plan vendor.	8	12

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30	35	15	10	5	5

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create 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. Statistical Methods by Schaum's series
2. Quality Assurance engineering by Schmidt.
3. Quality control handbook by Huran (McGraw hill)
4. Total quality control by Teisenbaum (McGraw hill)
5. Introduction to Probability and statistical applications by P.A. Mcyer.
6. Probability & statistics for engineer by Freund & Miller
7. Quality control & Industrial Statistics by Duencan (Taraporewala)
8. Statistical quality control by Grant (McGraw hill)

Course Outcome:

After learning the course the students should be able to:

- Understand the purpose and function of statistical quality control.
- Understand the differences between attributes and variables.
- Become familiar with basic methods of statistical process control.
- Solve quality-related problems using SQC tools and methods.

List of Experiments:

1. Study about introduction to statistics.
2. Study about statistics theory.
3. Study about probability theory.
4. Study about test of significance.
5. Study about correlation and regression analysis.
6. Study about introduction to quality.
7. Study about total quality management and ISO: 9000.
8. Study about \bar{x} - R chart.
9. Study about P -chart.
10. Study about C - chart.
11. Study about acceptance sampling.
12. Study about quality circle and six sigma.

Design based Problems (DP)/Open Ended Problem: None

Major Equipment: None

List of Open Source Software/learning website: www.nptel.ac.in

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.