

GUJARAT TECHNOLOGICAL UNIVERSITY

TEXTILE TECHNOLOGY (29) STATISTICAL QUALITY CONTROL & TEXTILE COSTING SUBJECT CODE: 2142905 B.E. SEMESTER IV

Type of course: Engineering

Prerequisite: Zeal to learn the subject

Rationale: This course is considered as Decision making tool to control quality and cost in Textile Engineering.

Teaching and Examination Scheme:

| Teaching Scheme | | | Credits C | Examination Marks | | | | | | Total Marks |
|-----------------|---|---|--------------|-------------------|--------|-----|-----------------|---|-----------|----------------|
| L | T | P | | Theory Marks | | | Practical Marks | | | |
| | | | | ESE (E) | PA (M) | | PA (V) | | PA (I) | |
| | | | | PA | ALA | ESE | OEP | | | |
| 3 | 2 | 0 | 5 | 70 | 20 | 10 | 30 | 0 | 20 | 150 |

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment; OEP-Open Ended problem; AL-Active learning;

Content:

| Sr. No. | Topics | Teaching Hrs. | Module Weightage |
|---------|--|---------------|------------------|
| 1. | Quality Dimensions of Quality Quality Engineering Terminology etc. | 2 | 6 % |
| 2. | Brief History and Statistical Methods Quality Control and Improvement | 2 | 6 % |
| 3. | Management Aspects of Quality | 2 | 6 % |
| 4. | The DMAIC Process Five-step problem-solving Procedure - Define, Measure, Analyze, Improve, and Control. | 2 | 6 % |
| 5. | Frequency Distributions Graphical Representation of Data Types of Distribution Curves Comparison of Frequency Distributions Mean, Median, Mode Range, Mean Range, Percentage Mean Range The Inter-quartile Range, Mean Deviation, Percentage Mean Deviation Standard Deviation, Coefficient of Variation, Variance | 2 | 6 % |
| 6. | Normal distribution; Binomial distribution and Poisson distribution | 1 | 3 % |
| 7. | Control Charts Introduction and Significance of Control Charts Control Charts for Variables (X-bar and R Charts) Control Charts for Attributes (p, np, c Charts) | 3 | 8 % |
| 8. | Statistics | 2 | 6 % |

| | | | |
|-----|---|---|-----|
| | Field of Statistics; Collection of Data; Population and sample; Types of sampling methods – Probability and Non-Probability. | | |
| 9. | Design of experiment (DOE) and their related different terminology Use of DOE; Guideline for designing of experiment; Classification of DOE; Two-level and three-level factorial designs. | 3 | 7 % |
| 10. | Analysis of variance ANOVA test hypothesis (one way and two way classifications) | 3 | 7 % |
| 11. | Regression & correlation: Karl Pearson's coefficient of correlation; Rank correlation coefficient and lines of regression | 2 | 6 % |
| 12. | Theory of Probability Different approaches to probability; Additional and multiplication rule of probability; Baye's theorem | 3 | 7 % |
| 13. | Instruction to costing Different methods of costing; types of cost; Textile costing. | 2 | 6 % |
| 14. | Material Cost Classification of Material Cost; Various methods for pricing raw cotton | 2 | 6 % |
| 15. | Labor cost Allocation of labor costs; indirect & direct labor | 2 | 6 % |
| 16. | Direct expenses & related examples Over head costs; Classification of over head cost; cost accounting procedure for over head costs; Depreciation; Methods of depreciation; List of cost centre in cotton textile mills, Process and product cost calculation; Marginal costing, contribution & profit formula practical utility of marginal costing; Break even concept, Cost-volume-profit Analysis | 3 | 8 % |

Suggested Specification table with Marks (Theory):

| Distribution of Theory Marks | | | | |
|------------------------------|---------|---------|---------|---------|
| R Level | U Level | A Level | N Level | E Level |
| 10 | 10 | 15 | 25 | 10 |

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate 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. Introduction to Statistical Quality Control by Douglas C. Montgomery published by John Wiley & Sons, Inc.
2. Principles of Textile Testing - J.E.Booth published by CBS Publishers & Distributors
3. Statistical Techniques in Spinning Mills by T.V.Ratnam published by South India Textile Research Association, Coimbatore
4. Leaf, G. A. V., Practical Statistics for the Textile Industry-Part I & II, The Textile Institute, UK, 1987.
5. Dhillon, B. S., Applied Reliability and Quality: Fundamentals, methods, and Procedures, Springer, London, 2007.
6. P.V.Bhave, Textile Costing , ATIRA, 1974.
7. Bowker, A.H., and Liberman, G.J., "Engineering statistics", Prentice Hall, N.J.1972

8. Murray P Spiegel, "Theory & Problems of Probability & Statistics"
9. Ray and Sharma, "Mathematical Statistics"
10. Bhattacharya, G.K., and Johnson, R.A., "Statistical concepts and methods", John Wiley, New Delhi, 2002
11. Hogg, R.V, Elliot, A.T., "Probability and Statistical Inference", Pearson Education, 6th Edition

Course Outcome:

After learning the course the students should be able to

1. Apply the knowledge of statistical methods for calculations of quality related parameters of different textile materials.
2. Calculate the cost of raw material, processes and products.

Tutorial Exercise:

1. Preparation of Flow Chart for History of Quality Control
2. Preparation of chart for different Quality Systems and Standards
3. Preparation of chart for The DMAIC process.
4. Numerical based on Mean, Median, Mode
5. Numerical based on Range, Mean Range, Percentage Mean Range
6. Numerical based on Mean Deviation, Percentage Mean Deviation
7. Numerical based on Standard Deviation, Coefficient of Variation, Variance
8. Numerical based on Normal Distribution, Binomial Distribution etc.
9. Numerical based on Variable Control Charts
10. Numerical based on Attribute Control Charts
11. To design the experiment for given factor and level combinations by different using different DOE methods.
12. Numerical based on one way ANOVA.
13. Numerical based on two way ANOVA.
14. Numerical based on Karl Pearson's coefficient of correlation, Rank correlation coefficient and lines of regression.
15. Numerical based on probability.
16. Product calculation related to textile mill.

List of Open Source Software/learning website: <http://nptel.iitm.ac.in>, World Wide Web, Google Search Engine etc.

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.