

PTX3I001 APPLICATION OF STATISTICS FOR TEXTILE MANUFACTURING

Course Objectives

To enable the students to learn about :

- Fundamental knowledge of statistical measures of central tendency and dispersion
- Random variables and concept of probability distribution.
- Certain standard distributions.
- Test of hypothesis regarding large samples and small samples
- Various statistical techniques and their application in quality control in textile manufacturing.
- Design of experiments

Course Outcomes

After successful completion of this course, the students should be able to

- Compute measures of central tendencies, dispersions and correlate the variables.
- Analyze random or unpredictable experiments and investigate important features of random experiments
- Construct probabilistic models for observed phenomena through distributions which play an important role in textile industry.
- Analyze sample data and interpret the same for population.
- Prepare various type control charts, interpret and outline the process capability.
- Design an experimental plan, analyse the results and draw conclusion.

Module-I (10 Hours)

Introduction: Importance of utility of statistical method for quality control in textile manufacturing industry. Applications of statistical measure - Measures of central tendency: Mean Median and Mode - Measures of variation: Range, Mean deviation, standard deviation and coefficient of variation. Population and sample, techniques of sampling, simple random sample, analysis of sample data, representation of sample data, practical examples.

Statistical Description of Quality: Random Variable, Continuous Random Variable- Normal Distribution, Discrete Random Variable- Binomial Distribution and poisson's distribution. normal approximation to binomial and poisson,, tables of normal distribution.

Module-II (12 Hours)

Testing of Hypothesis and significance level : Definition of population and sample, sampling distribution of mean and variance. - Estimation of parameters – confidence limit - Errors and choice of sample size Statistical hypothesis Testing of hypothesis for large samples (single mean, difference of means, single proportion, difference of proportions) – Small samples tests based on t and F distributions (single mean, difference of means, paired *t*- test and variance ratio test) – χ^2 (Chi-square) test for independence of attributes and goodness of fit.

Module-III (12 Hours)

Regression: Introduction. Method of least squares - linear regression equation - correlation coefficient - rank correlation. Regression through origin - multiple regression.

Statistical Quality Control: Concept of process control - General principle of control charts - action and warning limit-Control charts for variables - \bar{X} , R - charts - Control charts for attributes - p, np, c - charts - Tolerance limits . Pareto charts, Process capability analysis (C_p and C_{pk}), concept of six sigma process control.

Module-IV (12 Hours)

Acceptance Sampling: Basic idea about acceptance sampling, OC curve, producer's risk and customer's risk.

Design and Analysis of Experiment: One way and Two way classifications. Design of experiment- Completely randomized design - Randomized block design, Latin square design - factorial design.

Books Recommended :

1. Leaf G A V, "Practical Statistics for the Textile Industry", Part-I and II, The Textile Institute, U.K (1984).
2. Montgomery D C, "Introduction to Statistical Quality Control", Fourth Ed., John Wiley and Sons (Asia) Pte. Ltd., Singapore (2004).
3. Mehta P V, "Quality Management: An Overview", in 'Testing and Quality Management', Vol. 1, Ed. V K Kothari, IAFL Publication, New Delhi (1999).
4. Bhattacharya G.K. and Johnson R.A.: Statistical Concepts and Methods, John Wiley, New Delhi, 2002
5. Meloun M and Militky J, "Statistical data analysis: A practical guide", Woodhead Publishing Ltd. UK, 2011.
6. Hayavadana J, "Statistics for textile and apparel management", Woodhead Publishing Ltd., UK, 2012.