

AMIE20 DESIGN OF EXPERIMENTS

UNIT-1 INTRODUCTION

- 1.1 Strategy of Experimentation, Typical applications of Experimental design,
- 1.2 Basic Principles, Guidelines for Designing Experiments.

UNIT-2 BASIC STATISTICAL CONCEPTS

- 2.1 Concepts of random variable, probability, density function cumulative distribution function.
- 2.2 Sample and population, Measure of Central tendency; Mean median and mode, Measures of Variability, Concept of confidence level.
- 2.3 Statistical Distributions: Normal, Log Normal & Weibull distributions.
- 2.4 Hypothesis testing, Probability plots, choice of sample size.
- 2.5 Illustration through Numerical examples.

UNIT-3 EXPERIMENTAL DESIGN

- 3.1 Classical Experiments: Factorial Experiments; Terminology: factors, levels, interactions, treatment combination, randomization, Two-level experimental designs for two factors and three factors.
- 3.2 Three-level experimental designs for two factors and three factors,
- 3.3 Factor effects, Factor interactions, Fractional factorial design, Saturated Designs, Central composite designs.
- 3.4 Illustration through Numerical examples.

UNIT-4 ANALYSIS AND INTERPRETATION METHODS

- 4.1 Measures of variability, Ranking method, Column effect method & Plotting method,
- 4.2 Analysis of variance (ANOVA) in Factorial Experiments: YATE's algorithm for ANOVA,
- 4.3 Regression analysis, Mathematical models from experimental data.
- 4.4 Illustration through Numerical examples.

UNIT-5 QUALITY BY EXPERIMENTAL DESIGN

- 5.1 Quality, Western and Taguchi's quality philosophy, elements of cost, Noise factors causes of variation.
- 5.2 Quadratic loss function & variations of quadratic loss function.
- 5.3 Robust Design: Steps in Robust Design: Parameter design and Tolerance Design.
- 5.4 Reliability Improvement through experiments, Illustration through Numerical examples.

UNIT-6 EXPERIMENT DESIGN USING TAGUCHI'S ORTHOGONAL ARRAYS

- 6.1 Types of Orthogonal Arrays, selection of standard orthogonal arrays,
- 6.2 Linear graphs and Interaction assignment, Dummy level Technique,
- 6.3 Compound factor method, Modification of linear graphs.
- 6.4 Illustration through Numerical examples.

UNIT-7 SIGNAL TO NOISE RATIO

7.1 Evaluation of sensitivity to noise.

7.2 Signal to Noise ratios for static problems: Smaller-the-better type, Nominal-the –better-type, Larger-the-better type.

7.3 Signal to Noise ratios for Dynamic problems.

7.4 Illustration through Numerical examples.

UNIT-8 PARAMETER AND TOLERANCE DESIGN

8.1 Parameter and tolerance design concepts,

8.2 Taguchi's inner and outer arrays, parameter design strategy, tolerance design strategy.

8.3 Illustration through Numerical examples.

Reference Books:

1. "Design and Analysis of Experiments" by O Kempthorne
2. "Design and Analysis of Experiments" by Douglas C Montgomery

