DESIGN OF EXPERIMENTS

(Elective - II)

Course Code: 15ME2116

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Course Outcomes: At the end of the course, the student will be able to

CO1: Differentiate among various sampling distributions, apply hypothesis testing and select size, interpret computer output and apply regression approach to ANOVA

CO2: Analyze two factor factorial design, general factorial design, 2^2, 2^3, 2^k design; fit response curves and surfaces

CO3: Apply two - level fractional factorial design; apply block techniques and effect of confounding; carry out 3^k factorial design with confounding

CO4: Construct linear regression models and estimate the parameters; evaluate the confidence levels and predict new response observations

CO5: Apply surface response methods; apply method of steepest ascent, analyze second order response surface; propose experimental design for fitting response surfaces

UNIT-I (10-Lectures)

Strategy of experimentation: Guidelines for designing experiments, sampling and sampling distributions, hypothesis testing, choice of sample size.

Experiments with single factor**:** Analysis of variance, analysis of the fixed effects model, model adequacy checking, sample computer output, regression approach to the analysis of variance.

UNIT-II (10-Lectures)

Factorial designs: Principles, advantage of factorials, two-factor factorial design, general factorial design, fitting response curves and surfaces.

2^k factorial design: 2^2 design, 2^3 design, General 2^k design, single replicate of 2^k design.

UNIT-III (10-Lectures)

Two-level fractional factorial designs: one-half fraction of 2^K design, one-quarter fraction of 2^K design, blocking replicated 2^K factorial design, confounding in 2^K factorial design. Three-level and mixed-level factorial design: 3^K factorial design, confounding in 3^K factorial design, fractional replication of 3^K factorial design, factorials with mixed levels.

UNIT-IV (10-Lectures)

Regression models: Linear regression models, estimation of the parameters, hypothesis testing in multiple regression, confidence intervals in multiple regression, prediction of new response observations, regression model diagnostics.

UNIT-V (10-Lectures)

Response surface methods: Introduction, method of steepest ascent, analysis of second-order response surface, experimental designs for fitting response surfaces.

TEXT BOOK:

1. D.C. Montgomery, "*Design and Analysis of Experiments*", 5th edition, John Wiley and sons, 2009.

REFERENCES:

1. D.C. Montgomery," *Introduction to Statistical Quality Control*", 4th edition, John Wiley and sons, 2001.
2. Angela Dean and Daniel Voss, "Design and Analysis of Experiments", Springer, 1999