

**DESIGN AND ANALYSIS OF EXPERIMENTS**  
(Elective-II)

**Subject Code: 13ME2117**

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<b>4</b>	<b>0</b>	<b>3</b>

**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: Determine 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**

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**

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**

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**

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**

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*”, 5<sup>th</sup> edition, John Wiley and sons, 2009.

#### **REFERENCES:**

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