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|---------------|---|
| Course Title: | <b>Design and Analysis of Experiments</b> |
| Course Code:  | <b>BSTA-302</b>                           |
| Semester:     | <b>V</b>                                  |
| Credit Hours: | <b>03</b>                                 |

### **Learning Outcomes**

By the end of this course, students will be able to:

1. understand the basic principles of experimental design.
2. apply ANOVA and various multiple comparison tests.
3. learn the layout factorial experiments.
4. know the construction of Split-plot designs.

### **Course Outline**

#### **Unit – I**

##### **1.1 Introduction and Principles of Experimental Design**

Concept of experiment. Planning of experiment. Design of experiment and its terminology, Treatment arrays. Principles of experimental designs: Logical control on error. Basic methods for increasing the efficiency of experiments, Estimation of treatment contrasts and their precision, treatment structure, comparison with a control.

##### **1.2 Analysis of Variance (ANOVA)**

Analysis of Variance (ANOVA). One-way and Two-way Classifications: Layout, Statistical Model and Applications. Multiple comparison test: LSD Test.

#### **Unit – II**

##### **2.1 Basic Designs of Experiment**

Introduction. Basic Principles of Experimental Design. Basic Designs of Experiment (CRD, RCB, LSD): Theory and Applications, Estimation of Missing Observations, Relative Efficiency. Basic concepts of Fixed, Random and Mixed effect models.

#### **Unit – III**

##### **3.1 Factorial Experiments**

Factorial Design with Applications.

##### **3.2 Covariance Analysis of Experimental Designs**

Covariance analysis for Completely Randomized Design.

- **Teaching-learning Strategies:**

Class Lecture method, which includes seminars, discussions, assignments and projects. (Audio-visual tools are used where necessary)

- **Assignments-Types and Number with calendar:**

According to the choice of respective teacher.

- **Assessment and Examinations:**

According to the University's Semester Rules.

| Sr. No. | Elements             | Weightage | Details   |
|---------|----------------------|-----------|---|
| 1.      | Midterm Assessment   | 35%       | It takes place at the mid-point of the semester.  |
| 2.      | Formative Assessment | 25%       | It is continuous assessment. It includes: Classroom participation, attendance, assignments, and presentations, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.  |
| 3.      | Final Assessment     | 40%       | It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc. |

**Textbook:**

1. Montgomery, D.C. (2020). *The Design and Analysis of Experiments* (5<sup>th</sup> ed.). John Wiley and Sons, New York.

**Suggested Readings:**

1. Clewer, A. G., & Scarisbrig, D. H. (2013). *Practical Statistics and Experimental Design for Plant and Crop Science*. John Wiley and Sons, New York.
2. Cochran, W.C., & Cox, G.M. (2012). *Experimental Design* (3<sup>rd</sup> ed.). John Wiley and Sons, New York.
3. Steel, R.G.D., Torrie, J.H., & Dickey, D.A. (2008). *Principles and Procedures of Statistics: A Biometrical Approach*. McGraw-Hill, Michigan, USA.