

Stat 146 (Experimental Designs II)

Course Outline

Course Information

1. *Course Code:* Stat 146
2. *Course Title:* Experimental Designs II
3. *Course Description:* Analysis of unbalanced factorial experiments, fractional factorial designs; incomplete and confounded block designs; crossover and repeated measures designs; and response surface designs
4. *Prerequisite:* Stat 141 (Experimental Designs I)
5. *Credit:* 3 units
6. *Semester Offered:* Second
7. *Number of hours per week:* 3 hours lecture

Course Outcomes

1. Analyze unbalanced factorial experiments
2. Design and analyze symmetric factorial experiments
3. Construct and analyze fractional factorial designs
4. Build and analyze incomplete block designs
5. Design and analyze crossover and repeated measures designs
6. Build and evaluate response surface models

Course Topics

1. Factorial experiments with Unequal Cell Frequency
 - 1.1. The nature of unbalanced data and method of unweighted means
 - 1.2. Method of fitting constants
 - 1.3. Types of Sums of Squares

2. Symmetric Factorial Experiments
 - 2.1. Analysis of 2^k factorial experiments
 - 2.2. Analysis of 3^k factorial experiments
 - 2.3. Confounding in a 2^k factorial experiment
 - 2.4. Confounding in a 3^k factorial experiment
3. Fractional Factorial Designs
 - 3.1. Half-fraction of 2^k designs
 - 3.2. Quarter and higher fractions of 2^k designs
 - 3.3. One-third fraction of 3^k designs
4. Incomplete Block Designs
 - 4.1. Balanced Incomplete Block Designs
 - 4.2. Partially Balanced Incomplete Block Designs
5. Crossover and Repeated Measures Designs
 - 5.1. Crossover Designs
 - 5.2. Repeated Measures Designs
6. Introduction to Response Surface Designs
 - 6.1. Method of Steepest Ascent
 - 6.2. Central Composite and Box-Behnken Designs
 - 6.3. Simplex-Lattice Designs for Mixture Experiments

References

1. Montgomery, D. C. (2019). Design and Analysis of Experiments, 10th Edition. John Wiley & Sons.
2. Dean, A., Voss, D., and Draguljić, D. (2017). Design and Analysis of Experiments, 2nd Ed. Springer International Publishing AG.
3. Hinkelmann, K. and Kempthorne, O. (2008). Design and Analysis of Experiments (Vol. 1: Introduction to experimental design), 2nd Ed. John Wiley & Sons.
4. Hinkelmann, K. and Kempthorne, O. (2005). Design and Analysis of Experiments (Vol. 2: Advanced experimental design). John Wiley & Sons.
5. Box, G., Hunter, J., and Hunter, W. (2005). Statistics for Experimenters: Design, Innovation, and Discovery, 2nd Ed. John Wiley & Sons.
6. <https://online.stat.psu.edu/stat503/>
7. <https://online.stat.psu.edu/stat502/>

Class Requirements

1. Exercises (40%)
2. Long Exams (60%)

Grading System (% Passing: 60 %)			
Range	Grade	Range	Grade
98-100	1.00	53-59	3.25
95-97	1.25	46-52	3.50
90-94	1.50	39-45	3.75
85-89	1.75	32-38	4.00
80-84	2.00	25-31	4.25
75-79	2.25	18-24	4.50
70-74	2.50	11-17	4.75
65-69	2.75	0-10	5.00
60-64	3.00		