

Prefix, Number and Name of Course: ACM 641 Design and Analysis of Experiments

Credit Hours: 1

In Class Instructional Hours: 1

Labs: 0

Field Work: 0

Catalogue Description:

Prerequisite: MAT 202 or equivalent

Design of experiments (one, two and three factors), multiple comparisons, randomized complete block designs, Latin square design.

Reasons for addition:

To create a one-semester-hour module for the graduate Professional Applied and Computational Mathematics program where students will identify factors which affect a given process or phenomenon, both individually and in combination with minimum cost and maximum efficiency while maintaining the validity of results.

Student Learning Outcomes: Students will:	Content Reference:	Assessment:
1. implement a variety of experimental design techniques to compare population means together with diagnostics and interaction in the higher order experiments.	I, II, III	Individual homework assignments, group work, examinations and computer projects
2. design appropriate experiments to real-life data and test for the appropriateness of their design.	I, II, III	Individual homework assignments, group work, examinations and computer projects
3. demonstrate an understanding of how statistical software can be used in the field.	III.	Individual homework assignments, group work, examinations and computer projects.

Course Content:

I. One-factor experiment

- A. One-way analysis of variance: completely randomized design
- B. Tests for the equality of several variances
- C. Multiple comparisons
- D. Comparing treatments with a control
- E. Randomized complete block designs
- F. Diagnostics-residual analysis, model checking

- G. Latin square design
- II. Factorial experiments (two or more factors)
 - A. Interaction in the two-factor experiment
 - B. Two-factor analysis of variance
 - C. Three-factor experiments

III. Use of statistical software (SPSS and SAS)

Resources:

Scholarships in the Field:

Atkinson, A. C., Donev, A. N. and Tobias, R. D., *Optimum Experimental Designs with SAS*, Oxford University Press, 2007.

Box, G. E. P., Hunter, J. S. and Hunter, W. G., *Statistics for Experimenters: Design, Innovation and Discovery*, 2nd ed., N.J: Wiley-Interscience, 2005.

Brook, R. L. and Arnold, G. C., *Applied Regression Analysis and Experimental Design*, Dekker 1985.

Cortina, J. M. and Nouri, H., *Effect Size for ANOVA Designs*, CA: Sage, 2000.

Draper, N. R. and Smith, H., *Applied Regression Analysis*, 3rd edition, Wiley 1998.

Gonzalez, R., *Data Analysis for Experimental Design*, Guilford Press, 2009.

Hinkelmann, K. and Kempthorne, O., *Design and Analysis of Experiments*, Wiley 1994

Hinkelmann, K. and Kempthorne, O., *Design and Analysis of Experiments*, Volume 1, 2nd ed., New York: Wiley, 2008.

Kleinbaum, D. G., Kupper, L. L. and Muller, K. E., *Applied Regression Analysis and other Multivariable Methods*, 3rd edition, Duxbury Press 1998.

Mason, R. L., Gunst, R. F. and Hess, J. L., *Statistical Design and Analysis of Experiments: with Applications to Engineering and Science*, 2nd edition, Wiley 2003.

Mickey, R. M., *Applied Statistics: Analysis of Variance and Regression*, 3rd edition, Wiley-Interscience ,2004.

Miller, R., *Beyond ANOVA: The Basics of Applied Statistics*, New York: Wiley, 1996.

Montgomery, D. C., *Design and Analysis of Experiments*, 6th edition, Wiley, 2005.

Normand, L.F. And Mathews, D., *Practical Guide to Experimental Design*, New York: Wiley, 1997.

Neter, J., Wasserman, W. and Kutner, M. H., *Applied Linear Statistical Models*, 2nd edition, Richard D. Irwin 1985.

Ott, R.L. And Longnecker, M., *An Introduction to Statistical Methods and Data Analysis*, 5th ed., CA: Duxbury Press, 2001.

Rao, C. R., *Linear Statistical Inference and its Applications*, 2nd edition, Wiley Eastern 1973.

Ryan, T.P., *Modern Experimental Design*, N.J: Wiley, 2007.

Seber, G. A. F., *Linear Regression Analysis*, John Wiley & Sons 1977.

Winer, B. J., *Statistical Principles in Experimental Designs*, 3rd ed., New York: McGraw- Hill, 1991.

Periodicals:

Annals of Applied Statistics
Annals of Mathematical Statistics
Annals of Statistics

Biometrics

Biometrika

Communications in Statistics

Demography

International Statistical Review

Journal of the American Statistical Association
Journal of Applied Statistics

Journal of Applied Statistical Science

Journal of Statistical Computation and Simulation
Journal of the Royal Statistical Society

Scandinavian Journal of Statistics

Statistics in Medicine

Statistical Methods in Medical Research

Technometrics

The American Statistician

Electronic and/or Audiovisual Resources:

Electronic Journal of Statistics

Link to electronic journals web site (<http://www.e-journals.org/>)