

## Math 567 – Advanced Design of Experiments

**Course Description from Bulletin:** Various type of designs for laboratory and computer experiments, including fractional factorial designs, optimal designs, and space filling designs. (3-0-3)

**Enrollment:** Elective for AM and other majors.

### References:

A. Dey and R. Mukerjee, *Fractional factorial plans*, John Wiley & Sons, New York, 1999.

T. J. Santner, B. J. Williams, and W. I. Notz, *The design & analysis of computer experiments*, Springer-Verlag, New York, 2003.

C. F. Jeff Wu and Michael Hamada, *Experiments: planning, analysis, and parameter design optimization, 2<sup>nd</sup> Ed.*, John Wiley & Sons, Inc., New York, 2002.

**Other required material:** None

**Prerequisites:** MATH 476 or MATH 474

### Objectives:

1. Students will understand the difference between a designed experiment and observations, and why the former is preferable.
2. Students will understand three major kinds of experimental designs: fractional factorial designs, optimal designs, and space filling designs, and their relative advantages and disadvantages
3. Students will understand how to construct designs
4. Students will understand how to analyze data from designed experiments using regression and non-parametric methods

**Lecture schedule:** 3 50 minute (or 2 75 minute) lectures per week

### Course Outline:

	Hours
1. Introduction to experimental design — good and bad designs	3
2. Fractional Factorial Designs	15
a. Full factorial designs	
b. Orthogonal arrays	
c. Constructions and bounds	
d. ANOVA for designed experiments	
3. Optimal Designs	12
a. Linear regression models	
b. Alphabetic optimality	
c. Constructions	
4. Space filling designs	15
a. Robustness under model uncertainty	
b. Discrepancy and other measures of uniformity	
c. Constructions of space-filling designs	

d. Kriging and spline methods for analyzing data

<b>Assessment:</b>	Homework	10-20%
	Project(s)	10-40%
	Tests	0-20%
	Final Exam	30-50%

**Syllabus prepared by:** André Adler and Fred Hickernell

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