

## Statistical Experimental Design Course Registration

If you need to reserve a hotel room return by Dec. 1, 2007.  
Other attendees deadline is Dec. 21, 2007.

TO: Department of Plant Sciences  
North Dakota State University  
Loftsgard 166, PO Box 5051  
Fargo, ND 58105-5051

Questions contact:  
Karen Hertsgaard 701-231-8063, 701-793-1146 or  
Karen.Hertsgaard@ndsu.edu

Name	_____
Mailing Address	_____
Company	_____
Telephone	_____
E-mail	_____
Course Registration Fee \$400	
Hotel Reservations \$55 per night (\$220 for four nights) Please list nights you will stay _____ Failure to include room reservation will require you to make your own reservations.	
Total (Make checks payable to <b>NDSU—Plant Sciences</b> )	



**NDSU**  
North Dakota State University  
**ND Agricultural Experiment Station**

### IBMS

Providing reliable, high-quality, targeted research and education for U.S. barley producers and domestic and international malting and brewing industries at a single site. The IBMS Board is comprised of individuals from the malting and brewing industries, commodity groups and NDSU. The IBMS is part of the NDSU Agricultural Experiment Station (NDAES).

Director: Dr. Paul Schwarz  
701-231-7732  
Paul.Schwarz@ndsu.edu  
website address: ag.ndsu.edu/ibms/



### Barley CAP

The Barley Coordinated Agricultural Project (CAP) is a community effort of 30 scientists from 19 institutions focused on identifying molecular markers that will dramatically speed up breeding efforts to improve barley for food, feed and brewing. Funding is from the USDA-NRI-CSREES  
website address: barleycap.org



### NCI

Northern Crops Institute (NCI) is the international center for meeting and learning about northern grown crops produced in the four-state region of North Dakota, South Dakota, Minnesota and Montana. Situated on the campus of North Dakota State University, NCI exists as a forum to bring together customers, commodity traders, technical experts, processors and producers from all points of the globe for discussion, education, and technical service programs. Since 1983, the Institute has hosted visitors from over 127 countries.  
website address: northern-crops.com

NDSU is an equal opportunity institution. This publication will be made available in alternative format upon request to people with disabilities (701) 231-7881

# Introduction to Statistical Experimental Design

## A Short Course

Jan. 15-18, 2008

**Northern Crops Institute**  
**Bolley Drive, North Dakota**  
**State University, Fargo, ND**

### Sponsors

**Institute of Barley and Malt Sciences (IBMS)**  
**Barley Coordinated Agricultural Project (CAP)**  
**Northern Crops Institute (NCI)**  
**NDSU Agricultural Experiment Station (NDAES)**



# INTRODUCTION TO STATISTICAL EXPERIMENTAL DESIGN: A Short Course

## WHO SHOULD ATTEND

The introductory statistical experimental design short course is intended for individuals conducting research on agricultural products in the field or laboratory and field agronomists. Background needed for the course is knowledge of basic math.

An advanced statistical experimental design course may be offered in the future that includes the topics of confounding, fractional factorial designs, response surface methods and designs, and chemometrics methods.

The second course would be appropriate for laboratory researchers working in the food and cereal sciences and field researchers working with crops where end use quality is of prime importance.

The prerequisite for the advanced course will be the introductory short course.

## INSTRUCTOR

The Statistical Experimental Design Course will be taught by Dr. Rich Horsley. Dr. Horsley is a Professor and barley breeder in the Department of Plant Sciences, NDSU. He joined the faculty in 1988. Dr. Horsley received a B.S. in Agronomy from the University of Minnesota, an M.S. in Agronomy from NDSU, and a Ph.D. in Crop and Weed Sciences from NDSU. Dr. Horsley has taught a graduate level course in experimental design yearly since 1987.

## REGISTRATION

Registration for the course is \$400. This includes course materials, lunches and transportation between the hotel and NDSU Campus. Registration is due by Dec. 1, 2007 if reserving a hotel room. Dec. 21, 2007 is the deadline for all other registrants. For questions contact:

Karen Hertsgaard at 701-231-8063 or 701-793-1146  
Karen.Hertsgaard@ndsu.edu

## LOCATION & LODGING

The course will be held at the Northern Crops Institute on the North Dakota State University Campus in Fargo. Classes will begin at 8:30 AM Tues. Jan. 15 and end at 12:00 noon on Fri. Jan. 18. A block of hotel rooms are being held at the Holiday Inn (I-29 and 13th Ave S) in Fargo, ND at a rate of \$55.00 per night from Jan. 14 to 17. To reserve one of these rooms at this rate we must receive payment by Dec. 1, 2007 (payable to **NDSU- Plant Sciences**) with your registration. Failure to include room reservation will require you to make your own reservations.

## TOPIC OUTLINE

### STATISTICAL REVIEW

Types of variables  
Populations vs. Samples  
Measures of central tendency  
Measures of dispersion  
Variance of the mean and standard error  
Coefficient of variation

### PLANNING EXPERIMENTS

Types of experiments  
Items to consider in planning experiments  
Experimental units  
Replication  
Choice of design  
Randomization

### HYPOTHESIS TESTING

Type I error  
Type II error  
Power of the test  
Steps in testing hypotheses  
Testing the hypothesis that  $\mu$  is a specified value  
(*t*-test and confidence interval)

### COMPARISONS INVOLVING TWO SAMPLE MEANS

Sample means with equal variance  
(*t*-test, confidence interval, and *F*-test)  
Two sample means with unequal variance (*t*-test)

### COMPLETELY RANDOM DESIGN

ANOVA for any number of groups with equal replication  
ANOVA for any number of groups with unequal replication  
ANOVA with sampling  
Assumptions underlying ANOVA

### MEAN COMPARISON TESTS

Least Significant difference (LSD)  
Duncan's new multiple range test (DMRT)  
Linear contrasts

### RANDOMIZED COMPLETE BLOCK DESIGN

ANOVA for any number of treatments  
ANOVA with sampling  
ANOVA with missing data

### LATTICE DESIGN

Square lattice  
Rectangular lattice

### DIFFERENT ARRANGEMENTS USED IN EXPERIMENTAL DESIGNS

Factorial arrangements  
Split plot arrangements  
Split block arrangements  
Split-split plot arrangements

### COMBINED ANALYSIS OF EXPERIMENTS

Combined analysis of experiments across locations  
Combined analysis of experiments across years  
Combined analysis of experiments across time and space

### REGRESSION AND CORRELATION

Simple linear regression  
Simple correlation