

**STATISTICS 516X**  
**STATISTICAL DESIGN AND ANALYSIS OF MICROARRAY EXPERIMENTS**  
**SPRING 2007**

Location: 1134 Sweeney  
Time: 12:40-2:00 p.m. Tuesday and Thursday  
Instructor: Dan Nettleton dnett@iastate.edu <http://www.public.iastate.edu/~dnett/>  
Office: 111 Snedecor Hall (phone: 515-294-7754)  
Hours: 2:10-3:00 p.m. Tuesday and Thursday or other times by appointment

Purpose of the Course:

STAT 516X will cover application and practical use of statistical methods for designing and analyzing microarray experiments. Current statistical research topics related to statistical design and analysis of microarray experiments will be emphasized throughout the course. Students completing STAT 516X should be able to provide expert advice on microarray experimental design, perform appropriate analyses in collaboration with biological researchers, and be ready to consider research problems in the statistical design and analysis of microarray experiments. Furthermore, students should gain a sound understanding of the statistical principles important for good experimental design and analysis involving high-dimensional data.

Prerequisites:

STAT 500 is the formal prerequisite for 516X.

Grading:

Homework	25%
Midterm Exam	25% Tuesday, February 27, 12:40-2:00 p.m.
Project	15% Monday, April 16, 5:00 p.m.
Final Exam	35% Monday, April 30, 12:00-2:00 p.m.

On exam days, be sure to arrive early with a calculator and pen or pencil. No make-up exams will be given unless circumstances are exceptional. Your final course percentage will be determined by the following formula:

$$\text{Course Score} = 0.25 H + 0.25 M + 0.15 P + 0.35 F$$

where H, M, P, and F represent the score out of 100 possible on homework, the midterm exam, the project, and the final exam, respectively. Below is a rough grading scale that may be made more lenient to compensate for difficult homework and/or exams.

Score	100-93	92-90	89-87	86-83	82-80	79-77	76-73	72-70	69-67	66-63	62-60	59-0
Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F

## Grading (continued):

All students have the opportunity to earn good grades in Statistics 516X by learning the course material well. Please let your instructor know of any difficulties as soon as possible. If a student has a disability that qualifies under the Americans with Disabilities Act and Section 504 of the Rehabilitation Act and requires accommodations, he/she should contact the Disability Resources (DR) office for information on appropriate policies and procedures. DR is located on the main floor of the Student Services Building, Room 1076. Their phone number is 515-294-6624.

## Homework Guidelines:

- The purpose of all homework assignments in Statistics 516X is to help you learn the course material.
- All homework assignments are posted at <http://www.public.iastate.edu/~dnett/microarray/hw.shtml>.
- Due dates are posted on the web site and written on the homework documents.
- No late homework is accepted, but your lowest homework score will not be used to compute your grade.
- Answers to homework assignments should be neatly written or typed and well organized with no extraneous information.
- You are welcome to work with other students on homework problems. You must, however, write your own answers to the questions. Copying another's work is prohibited.

## Intended Course Coverage:

1. Introduction to statistical design and analysis of microarray experiments
2. Basic biology related to microarray technology
3. cDNA microarray technology
4. Oligonucleotide microarray technology
5. Microarray image processing
6. Normalization of two-color microarray data
7. Normalization and construction of expression measures using Affymetrix microarray data
8. Experimental design and mixed linear model analysis for two-color microarrays
9. Experimental design and mixed linear model analysis for Affymetrix microarray experiments
10. Managing inferential challenges associated with multiple testing
11. Power and sample size calculations for microarray experiments
12. Empirical Bayes analysis of microarray experiments
13. Clustering of microarray data
14. Quantitative real-time reverse transcriptase polymerase chain reaction for verification of differential expression
15. Identifying differentially expressed gene sets
16. Other current research topics on the statistical design and analysis of microarray experiments

We will use the free statistical software R throughout the course to help with statistical computing. SAS will be used occasionally.