

# STAT 662 Advanced Statistical Genetics

**Instructor:** Ruzong Fan,

**Classroom:** Blocker 411, Fall 2006 (for 2006-2007 academic year).

**Credits, Class Periods:** 3 credits; MWF 12:40-1:30PM.

## Description

This is a continuing course of **Stat 661 Statistical Genetics**. It intends for Ph.D students with advanced knowledge of statistics, genetics, and better mathematical preparation. The advanced materials of statistical genetics will be taken from Lange (2002) *Mathematical and Statistical Methods for Genetic Analysis*, 2nd edition, Springer. Moreover, the latest articles from journals such as *American Journal of Human Genetics*, *Nature*, *Nature Genetics*, and *Science* will be used to catch up with the latest development. Research topics of statistical genetics will be introduced for students to fit their interests and possibly lead to their dissertation topics.

## Prerequisites

Stat 610, 611, 661

## Course Outline

1. Basic principles of population genetics
2. Counting methods and the EM algorithm
3. Newton's method and scoring in genetics
4. Hypothesis testing and categorical data
5. Genetic identity coefficients
6. Applications of identity coefficients
7. Descent graph methods
8. Molecular phylogeny
9. Models of recombination
10. Sequence analysis
11. Poisson Approximation

12. Diffusion processes

13. Linkage disequilibrium mapping of quantitative trait loci

### **Instructional Objectives**

After taking this class, students will have advanced knowledge of modern statistical methods for genetic study, and can start to do research in the field.

### **Evaluation Methods of the Course**

Minimum requirements for a grade A: (1) Attend class regularly; (2) Do four problems with CORRECT SOLUTION each week. To be safe for a grade A, it is better to finish as many problems as possible! Of course, students are expected to work seriously on each problem which they choose. Students may choose problems from the problem list at the end of each chapter. Instructor does not specify which problems to choose for students, but he expect that students to choose the problems that the instructor himself has not had a solution yet! Homework problems count 100% for grade, no project, no exam! Homework due in every two week circle!

### **Relationship of the Course to Other Courses**

This is a continuing course of Stat 661 Statistical Genetics

### **Relationship of the Course to Major, Minor, or Option**

N/A – See above.

### **Consultation with Other Departments and Academic Support Units**

### **Technology Needs**

Student must have a pocket calculator, access to a modern computer which may run genetic software such as GENEHUNTER and MENDEL (e.g. Unix Sunstation), and TDT/S-TDT (Microsoft)

### **Frequency of Offering and Enrollment**

Once every two years

### **Effective date from**

January 2003