

PubH 8432 Probability Models Fall 2012

Credits:	3
Meeting Days:	Tuesday and Thursday
Meeting Time:	9:45-11:00 AM
Meeting Place:	MoosT 2-120
Instructor:	Dr. Saonli Basu
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Office Hours:	Monday 2:00-3:00PM

I. Course Description

The course will provide details on the construction and application of different mathematical and stochastic models in genetic studies. We will learn about segregation analysis, multipoint linkage, population-based and family-based association analysis. Different aspects of population genetics such as testing Hardy-Weinberg equilibrium, likelihood estimation of allele frequencies, population structure, linkage disequilibrium, and haplotyping will also be discussed. Students will learn both the theory and application of statistical genetics and gain hands-on experience with analyzing genetic data using available R packages or other analysis softwares.

II. Course Prerequisites

This is a 3 credit course. Prerequisites are Stat 8101-2 or equivalent; PubH8432; or instructor's consent. Some experience with Splus or R is useful; background in Molecular Biology is desirable.

III. Course Goals and Objectives

By the end of the course, students should have a good understanding of different stochastic processes and their applications in stochastic modeling of real datasets. We will primarily focus on Discrete Markov Chains, but Continuous Markov Process, Poisson Process; Brownian Motion will also be covered in this course.

IV. Methods of Instruction and Work Expectations

- There will be 6 homeworks, due approximately every 2 weeks.
- A final project.

V. Course Text and Readings

There is no textbook for this class.

The materials will also be drawn from:

- Lange, K.: Mathematical and Statistical Methods for Genetic Analysis (Statistics for Biology and Health), Springer 2002.
- Laird, NM. and Lange, C.: The Fundamentals of Modern Statistical Genetics (Statistics for Biology and Health), Springer 2011.
- Thompson, EA.: Statistical Inference from Genetic Data on Pedigrees by Eli. IMS, Beachwood, Ohio. 2000

VI. Course Outline/Weekly Schedule

Week	Topic	Readings
1	Review of Statistical Theory (Likelihood Theory, Hypothesis testing, EM algorithm, Linear Models)	
2	Basic principles of population genetics (background, HWE, linkage equilibrium, linkage disequilibrium, different methods for allele frequency estimation, selection)	
3	Kinship and Genetic Identity Coefficients	
4	Segregation Analysis	
5-7	Linkage Analysis	
8-9	Association Studies	
10-11	Population Structure; Cryptic Relatedness	
12-13	Meta Analysis	
14	Student Presentations	

VII. Evaluation and Grading

Course evaluation will be based on homework assignments (40%), Midterm (30%) and a final project (30%). A letter grade will be determined from the percentage of points each student receives. The curve for final grades will be: A = 95-100; A- = 90-94; B+ = 85-89; B = 80-84; B- = 75-79; C+ = 70-74; C = 65-69; C- = 60-64; F = below 60. For those registered S/N, S = 60-100.

Course Evaluation

Beginning in fall 2008, the SPH will collect student course evaluations electronically using a software system called CoursEval: www.sph.umn.edu/courseval. The system will send email notifications to students when they can access and complete their course evaluations. Students who complete their course evaluations promptly will be able to access their final grades just as soon as the faculty member renders the grade in SPHGrades: www.sph.umn.edu/grades. All students will have access to their final grades through OneStop two weeks after the last day of the semester regardless of whether they completed their course evaluation or

not. Student feedback on course content and faculty teaching skills are an important means for improving our work. Please take the time to complete a course evaluation for each of the courses for which you are registered.

Incomplete Contracts

A grade of incomplete "I" shall be assigned at the discretion of the instructor when, due to extraordinary circumstances (e.g., documented illness or hospitalization, death in family, etc.), the student was prevented from completing the work of the course on time. The assignment of an "I" requires that a contract be initiated and completed by the student before the last official day of class, and signed by both the student and instructor. If an incomplete is deemed appropriate by the instructor, the student in consultation with the instructor, will specify the time and manner in which the student will complete course requirements. Extension for completion of the work will not exceed one year (or earlier if designated by the student's college). For more information and to initiate an incomplete contract, students should go to SPHGrades at: www.sph.umn.edu/grades.

University of Minnesota Uniform Grading and Transcript Policy

A link to the policy can be found at onestop.umn.edu.

VIII. Other Course Information and Policies

Grade Option Change (if applicable)

For full-semester courses, students may change their grade option, if applicable, through the second week of the semester. Grade option change deadlines for other terms (i.e. summer and half-semester courses) can be found at onestop.umn.edu.

Course Withdrawal

Students should refer to the Refund and Drop/Add Deadlines for the particular term at onestop.umn.edu for information and deadlines for withdrawing from a course. As a courtesy, students should notify their instructor and, if applicable, advisor of their intent to withdraw.

Students wishing to withdraw from a course after the noted final deadline for a particular term must contact the School of Public Health Student Services Center at sph-ssc@umn.edu for further information.

Student Conduct, Scholastic Dishonesty and Sexual Harassment Policies

Students are responsible for knowing the University of Minnesota, Board of Regents' policy on Student Conduct and Sexual Harassment found at www.umn.edu/regents/polindex.html.

Students are responsible for maintaining scholastic honesty in their work at all times. Students engaged in scholastic dishonesty will be penalized, and offenses will be reported to the SPH Associate Dean for Academic Affairs who may file a report with the University's Academic Integrity Officer.

The University's Student Conduct Code defines scholastic dishonesty as "plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; or altering, forging, or misusing a University academic record; or fabricating or falsifying of data, research procedures, or data analysis."

Plagiarism is an important element of this policy. It is defined as the presentation of another's writing or ideas as your own. Serious, intentional plagiarism will result in a grade of "F" or "N" for the entire course. For more information on this policy and for a helpful discussion of preventing plagiarism, please consult University policies and procedures regarding academic integrity: <http://writing.umn.edu/tww/plagiarism/>.

Students are urged to be careful that they properly attribute and cite others' work in their own writing. For guidelines for correctly citing sources, go to <http://tutorial.lib.umn.edu/> and click on "Citing Sources".

In addition, original work is expected in this course. Unless the instructor has specified otherwise, all assignments, papers, reports, etc. should be the work of the individual student. It is unacceptable to hand in assignments for this course for which you receive credit in another course unless by prior agreement with the instructor. Building on a line of work begun in another course or leading to a thesis, dissertation, or final project is acceptable.

Disability Statement

It is University policy to provide, on a flexible and individualized basis, reasonable accommodations to students who have a documented disability (e.g., physical, learning, psychiatric, vision, hearing, or systemic) that may affect their ability to participate in course activities or to meet course requirements. Students with disabilities are encouraged to contact Disability Services to have a confidential discussion of their individual needs for accommodations. Disability Services is located in Suite 180 McNamara Alumni Center, 200 Oak Street. Staff can be reached by calling 612/626-1333 (voice or TTY).

Mental Health Services:

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. University of Minnesota services are available to assist you with addressing these and other concerns you may be experiencing. You can learn more about the broad range of confidential mental health services available on campus via www.mentalhealth.umn.edu