SYLLABUS & COURSE INFORMATION

SCHOOL OF PUBLIC HEALTH
UNIVERSITY OF MINNESOTA

PUBH 8446, SECTION 001

Advanced Statistical Genetics and Genomics
Spring 2020

COURSE & CONTACT INFORMATION

Credits: 3
Meeting Day(s): M/W
Meeting Time: 11:15-12:30
Meeting Place: Moos Health Sci Tower 2-520

Instructor: Baolin Wu, PhD
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Office Hours: TBD
Office Location: Mayo A442

COURSE DESCRIPTION

Statistical methods for analysis of genetic and genomic data including topics on multiple comparison and gene network modeling. Note this course is a continuation of PubH 7445 for PhD students in Biostatistics or Statistics.

COURSE PREREQUISITES

PubH 7445 Statistics for Human Genetics and Molecular Biology, Statistical theory at the level of Stat 8101-2, a college-level molecular genetics course is recommended, or permission by instructors.

COURSE GOALS & OBJECTIVES

After taking the course, the students are expected to understand the statistical challenges in genetics and genomics and important statistical methods developed for this field. The students should then be able to conduct independent reading and research in the future.

METHODS OF INSTRUCTION AND WORK EXPECTATIONS

Course Workload Expectations

The course will focus on several broad research topics over the semester. Each research topic will be presented in 4-6 week period in the rest of the semester (see class schedule). Students are expected to carefully read all the required readings, and are strongly encouraged to also read the optional readings.

Learning Community

School of Public Health courses ask students to discuss frameworks, theory, policy, and more, often in the context of past and current events and policy debates. Many of our courses also ask students to work in teams or discussion groups. We do not come to our courses with identical backgrounds and experiences and building on what we already know about collaborating, listening, and engaging is critical to successful professional, academic, and scientific engagement with topics.

In this course, students are expected to engage with each other in respectful and thoughtful ways.

In group work, this can mean:

- Setting expectations with your groups about communication and response time during the first week of the semester (or as soon as groups are assigned) and contacting the TA or instructor if scheduling problems cannot be overcome.
- Setting clear deadlines and holding yourself and each other accountable.
- Determining the roles group members need to fulfill to successfully complete the project on time.
- Developing a rapport prior to beginning the project (what prior experience are you bringing to the project, what are your strengths as they apply to the project, what do you like to work on?)

In group discussion, this can mean:

- Respecting the identities and experiences of your classmates.
- Avoid broad statements and generalizations. Group discussions are another form of academic communication and responses to instructor questions in a group discussion are evaluated. Apply the same rigor to crafting discussion posts as you would for a paper.
- Consider your tone and language, especially when communicating in text format, as the lack of other cues can lead to misinterpretation.

Like other work in the course, all student to student communication is covered by the Student Conduct Code (https://z.umn.edu/studentconduct).

COURSE TEXT & READINGS

No required textbooks. Materials will mainly be drawn from the literature. The readings are required (unless identified as optional). The readings have been carefully chosen from the field to represent very good and recent research papers.

The required and optional readings can be retrieved through the University of Minnesota's e-journals. If you have any difficulty accessing any readings, please contact the instructor.

COURSE OUTLINE/WEEKLY SCHEDULE

Week 1-4 **Multiple hypothesis testing in high-dimensional biomedical data: signal detection and reproducible research**

Week 5-11 **Genome-wide association and sequencing studies: association test, interaction modeling, risk prediction and integrative modeling**

Week 12-14 **Genetic summary data: statistical modeling and integrative analysis**

Readings to be distributed in the class.

SPH AND UNIVERSITY POLICIES & RESOURCES

The School of Public Health maintains up-to-date information about resources available to students, as well as formal course policies, on our website at www.sph.umn.edu/student-policies/. Students are expected to read and understand all policy information available at this link and are encouraged to make use of the resources available.

The University of Minnesota has official policies, including but not limited to the following:

- Grade definitions
- Scholastic dishonesty
- Makeup work for legitimate absences
- Student conduct code
- Sexual harassment, sexual assault, stalking and relationship violence
- Equity, diversity, equal employment opportunity, and affirmative action
- Disability services
- Academic freedom and responsibility

Resources available for students include:

- Confidential mental health services
- Disability accommodations
- Housing and financial instability resources
- Technology help
- Academic support

EVALUATION & GRADING

Course grade is based on course projects (one for each topic). A letter grade will be determined from the percentage of points each student receives. Please refer to the University's Uniform Grading Policy and Grading Rubric Resource at https://z.umn.edu/gradingpolicy]

Grading Scale
The University uses plus and minus grading on a 4.000 cumulative grade point scale in accordance with the following, and you can expect the grade lines to be drawn as follows:

% In Class	Grade	GPA
93 - 100%	A	4.000
90 - 92%	A-	3.667
87 - 89%	B+	3.333
83 - 86%	B	3.000
80 - 82%	B-	2.667
77 - 79%	C+	2.333
73 - 76%	C	2.000
70 - 72%	C-	1.667
67 - 69%	D+	1.333
63 - 66%	D	1.000
< 62%	F	

- A = achievement that is outstanding relative to the level necessary to meet course requirements.
- B = achievement that is significantly above the level necessary to meet course requirements.
- C = achievement that meets the course requirements in every respect.
- D = achievement that is worthy of credit even though it fails to meet fully the course requirements.
- F = failure because work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I (Incomplete).
- S = achievement that is satisfactory, which is equivalent to a C- or better
- N = achievement that is not satisfactory and signifies that the work was either 1) completed but at a level that is not worthy of credit, or 2) not completed and there was no agreement between the instructor and student that the student would receive an I (Incomplete).

Evaluation/Grading Policy	Evaluation/Grading Policy Description
Scholastic Dishonesty, Plagiarism, Cheating, etc.	You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means 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; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis (As defined in the Student Conduct Code). For additional information, please see https://z.umn.edu/dishonesty The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: https://z.umn.edu/integrity. If you have additional questions, please clarify with your instructor. Your instructor can respond to your specific questions regarding what would constitute scholastic dishonesty in the context of a particular class-e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam. Indiana University offers a clear description of plagiarism and an online quiz to check your understanding (http://z.umn.edu/iuplagiarism).
Late Assignments	Not accepted unless pre-arranged with the instructor.
Attendance Requirements	Required unless pre-arranged with the instructor.
Extra Credit	none

CEPH COMPETENCIES

Competency	Learning Objectives	Assessment Strategies
Analyze quantitative genetic data using appropriate biostatistical models and computer software.	**General outcomes** • Conduct statistical analysis of large-scale genetic data using software, create tables, interpret results, and write summary report **Signal detection** • Employ appropriate statistical models to extract signals from the large-amount of features **Hypothesis Testing** • Identify proper tests and statistics to conduct the hypothesis tests, and carry out the tests via their chosen software. **Computation** • Write computational programs and deliver usable software package for research use	Course projects
Interpret results of data analysis for public health research, policy or practice.	**Descriptive and Graphical Summaries** • Interpret analysis results from statistical models	Course projects