Course Title: Advanced Theory of Biostatistics II

Course Number: BIST 0701

Course Location: School of Public Health Building, Room 234

Course Date & Time: Monday 1:10 pm – 4:00 pm

Course Instructor: Yong Lin, Ph.D., Professor, Biostatistics Department, School of Public Health, Rutgers University, Room 214 in School of Public Health Building, Phone: (732)-235-5513 or 9621, email: linyo@rutgers.edu

Office Hours: Monday 4:00 pm – 5:30 pm or by appointment


Additional/Supplemental Readings/Resources:


Course Description: This course extends probability and statistical theory covered in BIST 0613 and 0614 to an advanced level, and continues the advanced inference topics arising in Biostatistics presented in Advance Theory of Biostatistics I (BIST 700). Topics include estimating equations, generalized estimating equation (GEE), restricted maximum likelihood (REML) methods, jackknife and bootstrap methods, permutation and rank tests, and Bayesian data analysis.

Selected Department Competencies Addressed: Each Department identifies competencies for each degree offered. The competencies addressed in this course for the Ph.D. for the Department of Biostatistics include:

- Demonstrate understanding of fundamental probability theory and statistical models to solve public health research questions.
- Demonstrate understanding of fundamental probability theory to address public health or medical problems
- Reinforce the review and critical methods and interpretations presented in published research studies, presentations of reports
- Reinforce use statistical computer packages to organize, analyze, and report collected data
Please visit the Department webpages on the School of Public Health’s website at http://sph.rutgers.edu for additional competencies addressed by this course for other degrees and departments.

**Course Objectives:** By the completion of this course, students will:

- **a)** be able to understand some of the basic foundational ideas in biostatistics which form the dominant schools of thought: Fisherian, and Bayesian.
- **b)** learn to use the classical statistical tools and results: Bayesian methodology, inference for regression models, and estimating equations.
- **c)** be able to begin to read and understand more theoretical orientated journal articles at a Ph.D. Biostatistician level, and apply the knowledge to their research and their dissertations.

**Course Requirements and Grading:**

- Lectures will be given each week.
- Homework will be assigned almost every week. Students are allowed to work in groups on homework if they like, but no one should copy directly from someone else’s paper.
- There will be an in-class midterm exam.
- A project will be assigned at the end of semester. It will likely be to read a journal article and make a 10-15 minute in-class presentation.
- There will be an in-class final examination.

The course grade will be based on homework assignments, the midterm exam, the final exam, a project, and class participation. The relative weight given to each of these components is

1) Homework 20%
2) Midterm Exam 35%
3) Project 10%
4) Final Exam 35%

Total: 100%

**Course Schedule:**

<table>
<thead>
<tr>
<th>Date</th>
<th>Class</th>
<th>Topic(s)</th>
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</thead>
<tbody>
<tr>
<td>01/27</td>
<td>1</td>
<td>Large Sample Results for LR-Based Methods</td>
</tr>
<tr>
<td>02/03</td>
<td>2</td>
<td>Estimating Equations (1)</td>
</tr>
<tr>
<td>02/10</td>
<td>3</td>
<td>Estimating Equations (2)</td>
</tr>
<tr>
<td>02/17</td>
<td>4</td>
<td>Hypothesis Tests under Misspecification and Relaxed Assumptions (1)</td>
</tr>
<tr>
<td>02/24</td>
<td>5</td>
<td>Hypothesis Tests under Misspecification and Relaxed Assumptions (2), Monte Carlo Simulation</td>
</tr>
<tr>
<td>03/03</td>
<td>6</td>
<td>Jackknife Method, Bootstrap Method (1)</td>
</tr>
<tr>
<td>03/10</td>
<td>7</td>
<td>Midterm exam</td>
</tr>
<tr>
<td>03/17</td>
<td>8</td>
<td>No Class (Spring Break)</td>
</tr>
<tr>
<td>03/24</td>
<td>9</td>
<td>Bootstrap Method (2)</td>
</tr>
<tr>
<td>03/31</td>
<td>10</td>
<td>Permutation and Rank Tests (1)</td>
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School of Public Health Honor Code: The School of Public Health Honor Code is found in the student bulletin (sph.rutgers.edu/academics/catalog/index.html). Each student bears a fundamental responsibility for maintaining academic integrity and intellectual honesty in his or her graduate work. For example, all students are expected to observe the generally accepted principles of scholarly work, to submit their own rather than another's work, to refrain from falsifying data, and to refrain from receiving and/or giving aid on examinations or other assigned work requiring independent effort. In submitting written material, the writer takes full responsibility for the work as a whole and implies that, except as properly noted by use of quotation marks, footnotes, etc., both the ideas and the works used are his or her own. In addition to maintaining personal academic integrity, each student is expected to contribute to the academic integrity of the school community by not facilitating inappropriate use of her/his own work by others and by reporting acts of academic dishonesty by others to an appropriate school authority. It should be clearly understood that plagiarism, cheating, or other forms of academic dishonesty will not be tolerated and can lead to sanctions up to and including separation from the Rutgers School of Public Health.

Policy Concerning Use of Recording Devices and Other Electronic Communications Systems: When personally owned communication/recording devices are used by students to record lectures and/or classroom lessons, such use must be authorized by the faculty member or instructor who must give either oral or written permission prior to the start of the semester and identify restrictions, if any, on the use of mobile communications or recording devices.