Course Syllabus

Course Title: Biostatistics Theory II

Course Number: BIST 0614

Course Location: Rutgers SPH, RM234, Piscataway

Course Date & Time: 3-5 pm on Tuesdays

Course Instructor: Amy Davidow, PhD, Associate Professor of Biostatistics

Rutgers School of Public Health, Rm 215

Email: davidoal@sph.rutgers.edu

Phone: 917 443 2403

Office Hours: 2-3pm on Tuesdays or by appointment

Course Assistant: To Be Announced


Course Description: This course will cover theory of estimation and hypothesis testing. Topics include sampling distributions, sufficiency, unbiasedness, maximum likelihood methods (estimation and tests). Emphasis is on the fundamental concepts of underlying theory.

Selected Concentration Competencies Addressed: Each Department identifies competencies for each degree offered. The competencies addressed in this course for the MS and DrPH for the Department of Biostatistics include:

- Apply probability and statistical methods to design experimental and observational studies in biomedical, clinical and public health research;
- Use probability and statistical theory to evaluate and identify appropriate methods of analysis;
- Conduct appropriate statistical analysis of data to solve medical and public health problems.

Please visit the Concentration webpages on the School of Public Health’s website at sph.rutgers.edu/ (http://www.sph.rutgers.edu/) for additional competencies addressed by this course for other degrees.
and concentrations.

Course Objectives: By completion of this course, students will be able to:

1. Apply probability and statistical methods to important statistical problems.
2. Use the properties of a random sample and principle of data reduction.
3. Perform statistical inference of point estimation, interval estimation and hypothesis testing.
4. Apply basic probability and standard statistical methods to design experimental and observational studies in biomedical, clinical and public health research.

Course Requirements and Grading:

- **Course Evaluation Description**:
  2. *Final Exam* 40 pts.
  3. *Homework Assignment* 20 pts.

  **Total:** 100 pts.

- **Grading policy**:
  1. On all homework assignments/problem sets, students are encouraged to discuss with one another, but work should be carried out and written up independently. If any two identical write-ups are found, both homework assignments are considered failed.
  2. It’s the students’ responsibility to make their papers legible. Unreadable work will NOT be graded.
  3. The students are asked to answer each question as accurately and concisely as possible. If it is necessary to attach the computer output with the homework assignment, ONLY the “essential” segments are required. Do NOT submit the complete output section or the log file. Otherwise, 50% points will be taken away.
  4. Unless notifying the instructor beforehand, late submission of homework will NOT be graded.

Course Schedule: (general plan for the course; some deviations maybe occur as needed.)

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics</th>
<th>Chapters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>Jan 21, 28</td>
<td>Convergence in Probability and in Distribution Delta Method, and Central Limit Theorem</td>
<td>5.1-5.3</td>
</tr>
<tr>
<td>3, 4, 5</td>
<td>Feb 4, 11, 18</td>
<td>Maximum Likelihood Method –MLE,</td>
<td>6.1, 6.2, 6.4. 4.8</td>
</tr>
</tbody>
</table>
Fisher’s information, asymptotic normality, R-C lower bound and efficiency, Maximum Likelihood Method-Multi-parameter cases. **The Method of Monte Carlo**

<table>
<thead>
<tr>
<th>Date</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb 25, March 3, March 10</td>
<td>Sufficiency- sufficient statistics, completeness and uniqueness, the exponential class of distributions, UMVUE</td>
</tr>
<tr>
<td>March 17</td>
<td>Vacation (March 17)</td>
</tr>
<tr>
<td>March 24</td>
<td>MIDTERM EXAM</td>
</tr>
<tr>
<td>March 31, April 7</td>
<td>Hypothesis testing</td>
</tr>
<tr>
<td>March 31, April 7</td>
<td>Maximum likelihood method – Maximum likelihood tests, multi-parameter cases: testing</td>
</tr>
<tr>
<td>April 14</td>
<td>Optimal tests of hypothesis</td>
</tr>
<tr>
<td>April 21</td>
<td>Review</td>
</tr>
<tr>
<td>April 28</td>
<td></td>
</tr>
<tr>
<td>May 5</td>
<td>FINAL EXAM</td>
</tr>
</tbody>
</table>

**Learning Management System:** Moodle will be used extensively throughout the semester for course syllabus, assignments, announcements, communication and/or other course-related activities. It is the student’s responsibility to familiarize themselves with Moodle and check it regularly. If you have difficulties accessing Moodle, please inform the instructor and Moodle Support (moodlehelp@ca.rutgers.edu). Moodle is accessible at moodle.rutgers.edu. 

**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.

Students with Disabilities: Rutgers University welcomes students with disabilities into all of the University’s educational programs. In order to receive consideration for reasonable accommodations, a student must Apply for Services by first completing a Registration Form with the Rutgers Office of Disability Services (ODS) at ods.rutgers.edu. The student will also be required to participate in an ODS intake interview and provide documentation. If reasonable accommodations are granted, ODS will provide you with a Letter of Accommodations which should be shared with your instructors as early in your courses as possible.

Graduate Student Computer Policy: Students are required to possess a personal laptop, no older than approximately two years, that must meet minimum requirements which may be found online at: sph.rutgers.edu/student_life/computer_requirements.html

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.

Withdrawal/Refund Schedule: Students who stop attending their course(s) without processing an Add/Drop Course form will receive a failing grade. Furthermore, students dropping to zero credits for the semester are considered withdrawn and must submit a completed Leave of Absence form from the School of Public Health’s Office of Student Affairs. The School of Public Health refunds tuition only. Administrative and technology fees are non-refundable. You may find the Withdrawal/Refund Schedule on the School of Public Health website at: sph.rutgers.edu/academics/registration/school_calendars.html
# Course Summary:

<table>
<thead>
<tr>
<th>Date</th>
<th>Details</th>
<th>Due by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tue Feb 4, 2020</td>
<td>Assignment One: Another Update! (<a href="https://rutgers.instructure.com/courses/35801/assignments/667836">https://rutgers.instructure.com/courses/35801/assignments/667836</a>)</td>
<td>3pm</td>
</tr>
<tr>
<td>Tue Feb 18, 2020</td>
<td>Assignment Two (<a href="https://rutgers.instructure.com/courses/35801/assignments/674340">https://rutgers.instructure.com/courses/35801/assignments/674340</a>)</td>
<td>3pm</td>
</tr>
<tr>
<td></td>
<td>Assignment One (updated and complete) (<a href="https://rutgers.instructure.com/courses/35801/assignments/670193">https://rutgers.instructure.com/courses/35801/assignments/670193</a>)</td>
<td></td>
</tr>
</tbody>
</table>