RUTGERS
School of Public Health

Course Title: Biostatistics Theory I

Course Number: BIST 0613

Course Pre- and Co-requisite(s): *None*

Course Location: Rutgers SPH, RM 2A, Piscataway

Course Date & Time: 6:00-8:00 pm on Tuesdays

Course Instructor: *Shou-En Lu, PhD, Associate Professor of Biostatistics, Rutgers School of Public Health, Rm 215*
shouen.lu@rutgers.edu

Office Hours: *Include if relevant (or indicate "By Appointment Only")*

Course Assistant: *revi* wx77@sph.rutgers.edu

Course Website: *canvas.rutgers.edu*

Required Course Text: Hogg, McKean, and Craig (2018), Introduction to Mathematical Statistics, 8th Edition, Pearson Prentice Hall.

Additional/Supplemental Readings/Resources: Casella, G. and Berger R.L. (2002) *Statistical Inference*, 2nd edition. Brooks Cole, ISBN: 0534243126

Course Description: Statistics is a branch of science dealing with the collection, analysis, interpretation, and presentation of numerical data. This course is an introduction to probability modeling as a basis for statistical inference. The underlying strategy in prediction and inference involves the determination of a probability modeling. This can be approached from two perspectives: analytical (mathematical) and computational (algorithmic). It is important for students to master both perspectives. Advanced calculus is sufficient background for the analytical. This course serves to lay a foundation in statistical theory for M.S., M.PH, and Ph.D. students so that they can pursue more advanced technical materials.

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

1. Apply basic probability theory and statistical methods/calculations for biomedical, clinical and public health research;
2. Use probability and statistical theory to evaluate and identify appropriate methods of analysis;
3. Conduct appropriate statistical analysis of data to study medical and public health problems;

Please visit the Concentration webpages on the School of Public Health's website at sph.rutgers.edu for additional competencies addressed by this course for other degrees and concentrations.

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

    a. Describe, prove, and apply the basic probability and distributional theory.
    b. Develop probability models for experiments.
    c. Apply basic probability and standard statistical calculations for experimental and observational studies in biomedical, clinical and public health research.

Course Requirements and Grading:

- **Course Evaluation Description***:*
    1. Midterm Exam   35 pts.
    2. Final Exam   40 pts.
    3. Homework Assignment   20 pts.
    4. Participation   5 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.

- *Please add the school-wide uniform grading scale:*

        Grading Policy: 94 – 100   A
                        90 – <94   A-
                        87 – <90   B+
                        84 – <87   B
                        80 – <84   B-
                        77 – <80   C+
                        70 – <77   C
                        <70   F

Course Schedule: *Include week by week listing of each class session:*

	Date	*Topics*	*Readings*
1	9/6	Introduction, Set Theory and Probability Set Function	**Chp 1.1-1.3**
2	9/13	Conditional Probability and Independence, Random Variables	**Chp 1.4-1.5**

3	9/20	Discrete Random Variables, Continuous Random Variables	**Chp 1.6, 1.7**
4	9/27	Expectation of a Random Variable, Some Special Expectations, Important Inequalities	**Chp 1.8, 1.9, 1.10**
5	10/4	Distribution of Two Random Variables	**Chp 2.1**
6	10/11	Transformations Bivariate Random Variables	**Chp 2.2**
7	10/18	**Midterm Exam**	
8	10/25	Conditional Distributions and Expectations, Correlation Coefficient	**Chp 2.3, 2.4**
9	11/1	Independent Random Variables	**Chp 2.5**
10	11/8	Binomial and Related Distributions, Poisson Distributions	**Chp 3.1, 3.2**
11	11/15	Normal Distribution, Γ, χ^2, and β Distributions	**Chp 3.3, 3.4**
12	11/22	No class—Thanksgiving schedule adjustment	
13	11/29	Multivariate Normal Distribution, t and F-distributions	**Chp 3.5, 3.6, 3.7**
14	12/6	Expectations of Functions, Convergence in Probability	**Chp 4.1, 4.2**
15	12/13	Convergence in Distribution and Central Limit Theorem	**Chp 4.3, 4.4**
16	12/20	**Final Exam**	

Learning Management System: Canvas 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 Canvas and check it regularly. If you have difficulties accessing Canvas, please inform the instructor and Canvas Support (help@canvas.rutgers.edu). Canvas is accessible at canvas.rutgers.edu.

School of Public Health Honor Code: The School of Public Health Honor Code is found in the School Catalog (sph.rutgers.edu/academics/catalog.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.

Commitment to Safe Learning Environment: The Rutgers School of Public Health is committed to helping create a safe learning environment for all students and for the School as a whole. Free expression in an academic community is essential to the mission of providing the highest caliber of education possible. The School encourages civil discourse, reasoned thought, sustained discussion, and constructive engagement. Provocative ideas respectfully presented are an expected result. An enlightened academic community, however, connects freedom with responsibility. The School encourages all students to disclose any situations where you may feel unsafe, discriminated against, or harassed. Harassment or discrimination of any kind will be not tolerated and violations may lead to disciplinary actions.

Student Well-Being: The School of Public Health recognizes that students may experience stressors or challenges that can impact both their academic experience and their personal well-being. If the source of your stressors or challenges is academic, students are encouraged to discuss these challenges and circumstances with their instructor, if they feel they may need additional support or temporary accommodations at the beginning or during this course. The course instructor may consider making reasonable temporary adjustments depending on the student's situation. For personal concerns or if additional support is needed, students may reach out to the Office of Student Affairs or any of the appropriate referral resources listed on the SPH Student Connect Canvas page.

Reporting Discrimination or Harassment: If you experience any form of gender or sex-based discrimination or harassment, including sexual assault, sexual harassment, relationship violence, or stalking, know that help and support are available. You may report such incidents to the RBHS Title IX Office or to the School of Public Health's Office of Student Affairs. Rutgers University has staff members trained to support survivors in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, and more. If you experience any other form of discrimination or harassment, including racial, ethnic, religious, political, or academic, please report any such incidents to the School's Office of Student Affairs. The School strongly encourages all students to report any incidents of discrimination or harassment to the School. Please be aware that all Rutgers employees (other than those designated as confidential resources such as advocates, counselors, clergy and healthcare providers as listed in Appendix A to Policy 10.3.12) are required to report information about such discrimination and harassment to the School and potentially the University. For example, if you tell a faculty or staff member about a situation of sexual harassment or sexual violence, or other related misconduct, the faculty or staff member must share that information with the RBHS Title IX Coordinator. If you wish to speak to a confidential employee who does not have this reporting responsibility, you can find a list of resources in Appendix A to University Policy 10.3.12. For more information about your options at Rutgers, please visit Rutgers Violence Prevention and Victim Assistance.

Overview of School Policies: Academic and non-academic policies and procedures, such as Auditing a Course, Retaking Courses, Grade Grievance and others that cover registration, courses and grading, academic standing and progress, student rights and responsibilities, graduation and more may be found under Policies on the School of Public Health website. Below are select specific policies; however, students are responsible for keeping informed about academic and non-academic policies and procedures beyond those noted on this syllabus.

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-support.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.

Policy Concerning Use of Turnitin: Students agree that by taking this course all required papers may be subject to submission for textual similarity review to Turnitin.com (directly or via learning management system, i.e. Canvas) for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the Usage Policy posted on the Turnitin.com site. Students who do not agree should contact the course instructor immediately.

Withdrawal/Refund Schedule: Students who stop attending their course(s) without submitting a completed 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/academic-calendar.html