Statistics 6302: Theory of Statistical Analysis
Spring 2018 Course Syllabus

Instructor: Dr. O. Chkrebtii

Lectures: 11:30 am - 12:25 pm on Mondays, Wednesdays, Fridays in Cockins Hall (CH) 312.

Office Hours: Monday, 12:25 pm - 1:30 pm (individual appointments may be possible in certain situations, when office hours conflict with other commitments and course work, but should be requested via email and will not be available on short notice).

Email: chkrebtii.1@osu.edu, **begin subject with "Stat 6302"**. To protect your privacy, **all course email correspondence must be conducted using your valid OSU name.# email account**. Also please keep in mind that due to the large volume of emails, I may not be able to answer promptly. Please consider whether your question would be best answered in person during office hours.

Office: 323 Cockins Hall (CH)

Grader: Yuyang Zhang

Course Description: Estimation, hypothesis testing, best tests, likelihood ratio tests, confidence sets, sufficiency, efficient estimators; intended primarily for students in the MAS degree program. The topics list is as follows:

1. Method of moments estimators and their properties
2. Maximum likelihood estimators and their properties
3. Efficient estimators; Cramer-Rao Lower Bound
4. Sufficient statistics; exponential families
5. Confidence sets, including approximate and bootstrap confidence intervals
6. Principles of hypothesis testing; duality of confidence intervals and tests
7. Most Powerful and Uniformly Most Powerful Tests
8. Generalized Likelihood Ratio Tests; examples in applied statistics
9. Theory of statistical inferences for comparing two samples
10. Additional discretionary topics, such as theory for contingency tables

Prerequisites: Stat 6301 or Stat 610 or Stat 6801 or Stat 620 or permission of the instructor.

Exclusions: Not open to students with credit for Stat 6802 or Stat 621 or Stat 622 or Stat 623.

Course Website: carmen.osu.edu (login with your web ID). Important announcements, course materials, homework problems and solutions, computing references, and other information about the class are posted on the course website.

Textbook: The reading list and homework problems will be from the course textbook:

- John A. Rice. *Mathematical Statistics and Data Analysis* (Third Edition). Duxbury, 2007.

Optional references include:

- Robert V. Hogg, Joseph W. McKean, and Allen T. Craig. *Introduction to Mathematical Statistics* (Seventh Edition). Pearson, 2013. [an accessible read]
- Larry Wasserman. *All of Statistics* (First Edition). Springer, 2004. [selected chapters]
- Lee J. Bain, Max Engelhardt. *Introduction to Probability and Mathematical Statistics* (Second Edition). Duxbury, 1987. [more theoretical, but not to the point of being inaccessible]

Course notes are based on material from these texts. More references are available upon request.

Course Materials: Partial notes will be posted on Carmen on the day before each class. These consist of a notes containing blank spaces, which I will fill in during the lecture. I will not share the marked-up slides, so please make arrangements with your classmates to obtain any missed class material. Please make sure that you understand and can do all the examples that we cover in class.

Computing: There is no formal computing component in this course. However, I will sometimes use simulations to illustrate topics covered in class. For this, I will be using the R statistical computing software and will post all (optional) relevant code on Carmen. R is available in the Department of Statistics computing laboratory and may be downloaded for free from http://www.r-project.org/. Many students prefer to use the interface RStudio, available for free at http://www.rstudio.com.

Homework and Project Assignments: You may discuss the problems with each other in general terms, but you must write your own homework solutions. Late submissions will <u>not</u> be accepted. Starting and trying to get help early will be helpful. Academic misconduct of any sort will not be tolerated. Please review OSU's policies at http://studentaffairs.osu.edu/csc/.

Test and Assignment Policy: Absolutely <u>no</u> late assignment submissions will be accepted. Electronic assignment submissions will <u>not</u> be accepted unless approved by the instructor beforehand. Missed tests or exams require formal documentation specifically stating that the test/exam was missed for this reason. Succeeding in this class requires practice, therefore solutions to practice problems and assignments will not be provided, but I am happy to help you understand individual questions. My tests are challenging and require conceptual understanding of the concepts including all the prerequisites. It is not enough to just memorize formulas or tests.

Re-grading of assignments or tests: Should there be any concerns with the grading, students must follow the procedure below. Any grade disputes should be clearly stated in a note

submitted to me in writing along the assignment/test/project within *at most* two weeks of the date on which the grade was returned. Errors such as ungraded sections or problems with addition will be resolved, but any submission that requires interpretation or explanation will undergo a full re-grading. That is, there is the possibility that *your grade may increase or decrease* as a result.

Grading: Grades will be allocated as follows:
Assignments 20 % ;
First Test 20 %, in class on Monday, February 19, 2018;
Second Test 20 %, in class on Monday, April 2, 2018;
Final Exam (cumulative) 40 %, 12:00pm - 1:45pm on Friday, April 27, 2018.

The following OSU standard rubric will be used to compute the final letter grade: A: 93 – 100, A-: 90 – 92.9, B+: 87– 89.9: B: 83 – 86.9, B-: 80-82.9, C+: 77-79.9, C: 73 – 76.9, C-: 70–72.9, D+: 67 – 69.9, D: 60–66.9, E: below 60. The instructor reserves the right to make appropriate changes to the above scheme if necessary. However, as usual there are no exceptions nor arbitrary grade adjustments for individual students, nor grade guarantees of any kind, for any reason. Students who fundamentally disagree with their final grade have recourse to a formal dispute mechanism through the university. The information is available here: http://www.gradsch.osu.edu/i.-overview-grievance.html.

Special Considerations: If a situation exists or arises that you think may hinder your progress in this class, you must notify me as soon as possible.

Advising: For questions related to prerequisites and course suggestions, please contact the Statistics Department's Graduate Program Coordinator, Michelle Lee (lee.2293@osu.edu).

Academic Misconduct: It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term academic misconduct includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentlife.osu.edu/csc/.

Disability Services: The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Mental Health Statement: 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. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Lifes Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273-TALK or at suicidepreventionlifeline.org.