STAT:5101 (22S:194) Statistical Inference II, Spring 2015

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Course Web Pages:	Start at http://www.stat.uiowa.edu/~jblang/s194 [not on ICON!] [username: *xxxxx* password: *xxxxxxxxx*]
Lecture:	10:30A-11:20P MWF 14 SH
Instructor:	Professor Joseph B. Lang, 241 SH, joseph-lang@uiowa.edu
Office Hours:	M 11:20-12:20, W 9:00-10:00, 11:20-12:20, or by appointment
Pre-Requisites:	STAT:5100 (22S:193) or equivalent
Department, College:	Statistics and Actuarial Science, Liberal Arts and Sciences
DEO:	Professor Joseph B. Lang, 241 SH, 335-0712, joseph-lang@uiowa.edu
Main Office:	241 Schaeffer Hall

Required Text:

Casella, G. and Berger, R.L. (2002). *Statistical Inference*. 2nd edn. Belmont, CA: Duxbury Press.

Supplementary Texts:

DeGroot, M.H. and Schervish, M.J. (2002). *Probability and Statistics*, 3rd ed. Boston: Addison-Wesley.

Hogg, R.V. and Tanis, E.A. (1997). *Probability and Statistical Inference*, 5th ed. Upper Saddle River, NJ: Prentice Hall.

Hogg, R.V. McKean, J.W., and Craig, A.T. (2005). *Introduction to Mathematical Statistics*, 6th ed. Upper Saddle River, NJ: Pearson Prentice Hall.

Wackerly, D.D., Mendenhall, W. and Scheaffer, R.L. (1996). *Mathematical Statistics with Applications*, 5th ed. Belmont, CA: Duxbury Press.

Course Description:

This is the second course in the two-semester, masters level, statistical inference sequence STAT 5100-1 (22S:193-4). The first course covered introductory probability and distribution theory. This second course gives a non-measure theoretic treatment of the foundations of statistical inference, primarily from the Frequentist perspective. We will begin with a discussion of important asymptotic/approximation results. We then discuss estimation and hypothesis

testing theory as covered in Chapters 6-10 in Casella and Berger (2002). Time-permitting, we will delve deeper into the foundations and compare Frequentist and Bayesian inference paradigms. Topics covered will include continuous mapping theorems, delta method, finding and evaluating point and interval estimates, and finding and evaluating hypothesis tests. To address these topics we will explore such concepts as sufficiency, completeness, ancillarity, unbiasedness, consistency, efficiency, asymptotic approximations, and stochastic operating characteristics. Other keyphrases include, method of moments, maximum likelihood, mean square error, minimum variance unbiased estimation, information identities and inequality, asymptotic efficiency, asymptotic normality of estimators, likelihood and score functions, size, power, p-values, uniformly most powerful tests, conditioning arguments, etc. Finally, we will use computer simulation to corroborate many of the important results.

Course Objectives:

The successful student will leave this course with a basic understanding of many of the important foundational concepts in statistical inference. He or she will be comfortable using a wide variety of mathematical tools for solving statistical inference problems. And, he or she will appreciate the usefulness of the computer program R for addressing inference questions and for simulating to corroborate findings and to check answers.

Course Organization:

Lectures. The 50 minute meetings on MWF will typically be used to work through examples and to give a running summary of the material ("the big picture"), as seen from the instructor's perspective. Students will be expected to participate in the worked examples. We will cover the material from parts of Chapter 5 and Chapters 6-10, in Casella and Berger (2002), and, time permitting, some foundational comparisons of Frequentist and Bayesian inference. We will not necessarily cover this material one section at a time. At times, we will use an integrated approach that illustrates the concepts of several sections through multi-part examples. It follows that you will be expected to read several sections at a time with the goal of understanding the big picture.

Homework Exercises. Homework problems will be assigned about once per week, and posted on the course web page. You will typically have one week to turn in the assigned problems. Many of the problems will be assigned during the course of working through an example in lecture. Some of these problems will come from the book, or at least they will be based on problems in the book. By 10:30am of the due date, you will turn in your stapled homework set for grading. Your homework must **include a cover sheet** that is blank except for your name in the upper right corner.

Portfolios. You will include all of your worked exercises (graded and un-graded) in a portfolio. You will be asked to hand in your portfolio at least once during the semester. The quantity, quality, and neatness of the work in this portfolio will be assessed and will count toward your participation score.

Computing. Some of your homework will require the use of the computer. I will give sample code as needed. The freeware package R will typically be used to perform calculations, create graphics, and carry out small-scale simulation studies.

> Note: R is available on the HP machines in the UNIX Computing Lab (346 SH) and most all of the ITC labs, such as the Myers Computing Lab (41 SH). It can also be downloaded from http://cran.us.r-project.org to your personal computer.

Exams. There will be two in-class midterms (Fri, Feb 20 and Fri, Apr 3) and one final exam (TBA) in this course. The exams will all be closed-book. You are allowed to use one (two-sided) crib sheet for the first midterm, two for the second midterm, and three (two-sided) crib sheets for the final. Bring along a pencil, calculator, and scratch paper.

Point Earning Opportunities. Point-Earning Opportunities (PEOs) will be given on occasion; some will be pre-announced. PEOs will be in the form of in-class exercises, minute papers, and attendance checks.

Course Pace (tentative):

Chapter 5...Weeks 1 through 2
Chapter 6...Weeks 3 through 5 *[Exam #1, Fri, Feb 20]*
Chapter 7...Weeks 5 through 7
Chapter 8...Weeks 8 through 10 *[Exam #2, Fri, Apr 3]*
Chapter 9...Weeks 11-12
Chapter 10..Weeks 13-14
Inference Paradigms ...Time Permitting *[Final Exam, TBA]*

Course-Specific Guidelines and Policies:

Course Web Page. Reading assignments, announcements, homework, exam descriptions, and supplementary materials will be made available on the password-protected course web page; start at http://www.stat.uiowa.edu/~jblang/s194 [not on ICON!]. You should check the course pages daily.

Reading Ahead. It is vitally important that you read ahead (see the calendar page). If the material in a lecture is completely new to you, you will find it very difficult to get much out of lecture.

Effort Expectations. My effort expectations align with the guideline adopted by the college of LAS: "*for each semester hour credit in the course, students should expect to spend two hours per week preparing for class sessions (e.g., in a three-credit-hour course, standard out-of-class preparation is six hours).*" Of course, you need to keep in mind that the '*6 hours per week*' is an average taken over the weeks in the semester. It is also an average taken over a heterogeneous collection of students and courses. Thus, effort amounts will vary. It is fair to say, however, that the more effort you put in, the more you will get out of the course.

Attendance and Participation. Students are expected to attend and participate in lecture. You will be asked many questions, and you will be strongly encouraged to ask lots of questions. If you miss a class, you run the risk of missing a point-earning opportunity, which cannot be made-up.

Working Together. Unless instructed otherwise, you may work together on the homework problems. However, you must write up your own solutions *in your own words*. If you are personally asked to write up your own solutions and subsequently turn in material that is obviously in the same words as a fellow student, the work will be considered to be plagiarized. Plagiarism will be dealt with according to the policies of the College of Liberal Arts and Sciences and the University (see additional information at the end of this syllabus).

Late Homework. Unless otherwise instructed, homework is due at 10:30am. Late homework has a discrete half-life of 24 hours; that is you get 50% credit if it is handed in late, but within 24 hours of the due time; you get 25% credit for the next 24 hours, etc. Homework not handed in directly to me must be handed in to a department secretary (located in 241 SH)--it must include a hand-in time and date, and must be signed by the department secretary. (It follows that you cannot hand in homework after the main office is closed.)

Grading Questions. Questions about grading must be asked within one week of the graded work's return.

Electronic Etiquette. While in the classroom, you will not be allowed to send or check text messages, send or check email, browse the web, or use a cell phone. Social networking of any kind is not allowed. Please keep cell phones in your bag/backpack. If your cell phone is visible, it will be taken from you and placed in the front of class until the period has ended.

Grading and Components for Evaluation

Your final score $\boldsymbol{S}$ will be computed as $\boldsymbol{S} = 0.20\boldsymbol{M_1} + 0.25\boldsymbol{M_2} + 0.25\boldsymbol{F} + 0.25\boldsymbol{H} + 0.05\boldsymbol{P}$, where $\boldsymbol{M_i}$ = percent credit on midterm i, $\boldsymbol{F}$ = percent correct on final, $\boldsymbol{H}$ = percent credit on homework and $\boldsymbol{P}$ = participation score on a 0-100 scale. Your participation score $\boldsymbol{P}$ will be made up of your portfolio score and percent credit on point-earning opportunities.

Letter grades (including +'s and -'s) will be awarded according to a 90-80-70-60 schedule (e.g. if $\boldsymbol{S} \geq 90$ then a grade of A- or better will be awarded). Class participation will be considered when a student "falls on the borderline" between two grades. These are guaranteed cutoffs, so it is possible (but unlikely) that everyone receives an 'A.' I do, however, reserve the right to lower (but not raise) the cutoffs. Note that with this grading scheme you are not "graded on a curve," and so you are not competing with fellow students. Therefore, you are not penalized for working together to better understand concepts.

Miscellaneous

Help outside of class:

This course has a TA who will have regular office hours. The TA will also hold a weekly help session. I also have regular office hours. Sometimes it is effective to ask specific questions via email.
Course web pages; start at
http://www.stat.uiowa.edu/~jblang/s194.
A list of tutors is maintained by the Department of Statistics and Actuarial Science
at http://www.stat.uiowa.edu/courses/tutors.html .

Campus Resources for Students
Writing Center 110 English-Philosophy Building, 335-0188,
www.uiowa.edu/~writingc
Speaking Center 12 English-Philosophy Building, 335-0205,
www.uiowa.edu/~rhetoric/centers/speaking
Tutor Referral Service Campus Information Center, Iowa Memorial Union, 335-3055,
www.imu.uiowa.edu/cic/tutor_referral_service

Help with R software:

SimpleR. Go
to http://www.math.csi.cuny.edu/Statistics/R/simpleR/index.html
(*N.B. You may have to scroll down a bit to get to the simpleR table of contents.*)

An Introduction to R, by Elizabeth Slate and Elizabeth Hill.

College of Liberal Arts and Sciences: Policies and Procedures

Administrative Home
The College of Liberal Arts and Sciences is the administrative

home of this course and governs matters such as the add/drop deadlines, the second-grade-only option, and other related issues. Different colleges may have different policies. Questions may be addressed to 120 Schaeffer Hall, or see the CLAS *Student Academic Handbook.*

Electronic Communication
University policy specifies that students are responsible for all official correspondences sent to their University of Iowa e-mail address (@uiowa.edu). Faculty and students should use this account for correspondences. (*Operations Manua*l, III.15.2 Scroll down to k.11.)

Accommodations for Disabilities
A student seeking academic accommodations should first register with Student Disability Services and then meet privately with the course instructor to make particular arrangements. See www.uiowa.edu/~sds/ for more information.

Academic Fraud
Academic fraud, including plagiarism and other forms of cheating, is a serious matter and is reported by the instructor to the departmental DEO and to the Associate Dean for Undergraduate Programs and Curriculum. All students in the College of Liberal Arts and Sciences should review and understand the CLAS Code of Academic Honesty.

CLAS Final Examination Policies
Final exams may be offered only during finals week. No exams of any kind are allowed during the last week of classes. Students should not ask their instructor to reschedule a final exam since the College does not permit rescheduling of a final exam once the semester has begun. Questions should be addressed to the Associate Dean for Undergraduate Programs and Curriculum.

Making a Suggestion or a Complaint
Students with a suggestion or complaint should first visit the instructor, then the course supervisor, and then the departmental DEO. Complaints must be made within six months of the incident. See the CLAS Student Academic Handbook.

Understanding Sexual Harassment
Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances

learning. Incidents of sexual harassment should be reported immediately. See the UI Comprehensive Guide on Sexual Harassment for assistance, definitions, and the full University policy.

Reacting Safely to Severe Weather
In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit the Public Safety web site.

*These CLAS policy and procedural statements have been summarized from the web pages of the College of Liberal Arts and Sciences and The University of Iowa *Operations Manual*.

University Examination Policy

Final Examinations. An undergraduate student who has two final examinations scheduled for the same period or more than three examinations scheduled for the same day may file a request for a change of schedule before the published deadline at the Registrar's Service Center, 17 Calvin Hall, 8-4:30 M-F, (384- 4300).

Missed exam policy. University policy requires that students be permitted to make up examinations missed because of illness, mandatory religious obligations, certain University activities, or unavoidable circumstances. Excused absence forms are required and are available at the Registrar web site: http://www.registrar.uiowa.edu/forms/absence.pdf

I hope you all have an enjoyable and successful semester. Good luck in all of your courses.

Last updated: