ECON 504/STAT 604: Advanced Economic Statistics

Date: Fall 2010 Time: MW 9:00 – 10:15 am Location: Baker Hall 271 Course Text: Casella, G., Berger, R.L., 2002. *Statistical Inference*, 2nd ed.. Duxbury, Pacific Grove, CA.

Instructor:

Dr. John A. Dobelman <u>dobelman@stat.rice.edu</u> Duncan Hall 2100: 713 348 5681 Office Hours: By appointment.

<u>Teaching Assistant (TA)</u>: Mr. Pavlo Demchuk <u>pdemchuk@rice.edu</u> Baker Hall Office Hours: By appointment

Course Website: www.stat.rice.edu/~dobelman (see courses)



Course Description:

This course is designed to provide an overview of advanced mathematical statistics for economics, political science and management. Background in a calculus-based statistics course is assumed. Topics include random variables, distributions, transformations, moment generating functions, common families of distributions, independence, sampling distributions, the basics of estimation theory, hypothesis testing and Bayesian inference.

<u>Course Content</u>: Chapters 1 - 12 of text and possible special topics. Topics/chapters include

1. Probability Theory. Set Theory. Probability Theory. Conditional Probability and Independence. Random Variables. Distribution Functions. Density and Mass Functions.

2. Transformations and Expectations. Distribution of Functions of a Random Variable. Expected Values. Moments and Moment Generating Functions. Differentiating Under an Integral Sign.

3. Common Families of Distributions. Introductions. Discrete Distributions. Continuous Distributions. Exponential Families. Locations and Scale Families. Inequalities and Identities.

4. Multiple Random Variables. Joint and Marginal Distributions. Conditional Distributions and Independence. Bivariate Transformations. Hierarchical Models and Mixture Distributions. Covariance and Correlation. Multivariate Distributions. Inequalities.

5. Properties of a Random Sample. Basic Concepts of Random Samples. Sums of Random Variables from a Random Sample. Sampling for the Normal Distribution. Order Statistics. Convergence Concepts. Generating a Random Sample.

6. Principles of Data Reduction. Introduction. The Sufficiency Principle. The Likelihood Principle. The Equivariance Principle.

7. Point Estimation. Introduction. Methods of Finding Estimators. Methods of Evaluating Estimators.

8. Hypothesis Testing. Introduction. Methods of Finding Tests. Methods of Evaluating Test.

9. Interval Estimation. Introduction. Methods of Finding Interval Estimators. Methods of Evaluating Interval Estimators.

10. Asymptotic Evaluations. Point Estimation. Robustness. Hypothesis Testing. Interval Estimation.

11. Analysis of Variance and Regression. Introduction. One-way Analysis of Variance. Simple Linear Regression.

12. Regression Models. Introduction. Regression with Errors in Variables. Logistic Regression. Robust Regression.

<u>Grading</u>: 35% assignments, 30% midterm examination, 30% final examination, and 5% course participation. Late policy: 20% penalty for HW turned in by next class; no credit for later than this. The instructor will not be able to print out emailed homework. You might be able to negotiate with the TA.

Attendance:

Students are expected to attend class. Although we plan on keeping the course website up to date, if a student misses a class, then he or she is responsible for keeping up with the course material and finding out if any exams, quizzes, or homeworks have been assigned or scheduled.

Laptops and Other Portable Electronic Devices.

Unless so requested by the instructor, please do not use these devices during class. From time to time the instructors may ask a student to look something up, but in most cases this is not necessary.

<u>Software</u>

Although this is a mathematically-oriented course, which could theoretically provide for no calculations whatsoever, such an approach today is unrealistic. Most problem you will be solving will probably require numerical likelihood calculations, inversions, etc. It is impossible to perform statistical/quantitative data analysis today without some sort of computer software, and you should become proficient with one or more statistical software packages. The most widely used data analysis software in the real world today is Microsoft Excel, and its capabilities are impressive. However, more specialized software is

sometimes needed, such as Matlab, R, S-Plus, SAS, Resampling Stats, SPSS, Stata, StatTools, @Risk, Maple, Mathematica, C-Plex, SQL, etc. Of these, R has become the choice of many because of its ease of use and low cost (FREE!). Download information for some of these packages is available on the course website(s). One can also program most statistical procedures in a "high-level" programming language such as Java, C++, FORTRAN, VB, etc., along with specialized add-in routine libraries, but these require a lot of work to code and debug. Additionally, you will find that most corporate employers will not be paying for the nice software that is available for you here on campus. Consequently, to enhance your future value to your future employer, we suggest that you become proficient in Excel, R and SQL/SAS.

Rice Honor Code:

Before enrolling in this course, you must understand and agree to abide by the Honor System in place at Rice University which protects the academic integrity of all coursework. All students (including graduate students) at Rice are bound by the Rice Honor Code. New students should familiarize themselves with the Honor Code before starting classes. The Honor Code is a unique feature at Rice, and one that is valued highly. Honor Code violations are very serious, and can lead to dismissal from the University. See <u>http://tinyurl.com/cfhs52</u>

Examinations, if held, are conducted under pledged conditions. Proper recitation and use of the Honor Pledge on examinations will normally be worth 5% of the exam grade.

Homework and group assignments/projects may be worked on with other class members but each student must submit their own work for credit. Homeworks should be submitted by each person, but you should indicate with whom you worked when applicable. No direct copying is allowed. Group projects and assignments may be submitted by the group.

Disabilities:

Any student with a documented disability needing academic adjustments or accommodations is requested to speak with me during the first two weeks of class. All discussions will remain confidential. Students with disabilities should also contact Disability Support Services in the Ley Student Center. Further information is available at http://dss.rice.edu/.