STAT 431: Overview of Mathematical Statistics

Date: Fall 2010
Time: TTh 1:00 pm – 2:20 pm
Location: Duncan Hall 1075
Course Text: Casella, G., Berger, R.L., 2002. *Statistical Inference*, 2nd ed.. Duxbury,
     Pacific Grove, CA.

Instructor:
Prof. John A. Dobelman
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Course Website:
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Teaching Assistant (TA):
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Course Description:
This course is designed to provide an overview of mathematical statistics at an advanced undergraduate or graduate level. 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.

Course Content: 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.

Grading: 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 grader.

Attendance:
Students are expected to attend class. 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.

Rice Honor Code:
All examinations are conducted under pledged conditions. Homework is also to be pledged. It may be worked on with other class members but each student must submit their own work for credit. You should indicate with whom you worked when applicable. Note that the use of prior years' and other solutions to text exercises is considered UNAUTHORIZED AID and is not permitted under the Rice Honor code, and infractions shall be reported.

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/.