STAT 700 - Fall 2012

Course Syllabus

Time and Place: **TuTh 5-6:15 PM, MTH 0307**

Course Title: **Mathematical Statistics I**

Textbook: **Jun Shao, Mathematical Statistics, 2nd ed., Springer, 2003. ISBN 0-387-95382-5**

Instructor: **Prof. Abram Kagan**

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The sequence STAT 700-701 (STAT 701 to be taught in Spring 2013) covers all the basic concepts and results of Mathematical Statistics presented in a mathematically rigorous fashion. The sequence is a core for the Ph. D. qualifying exam in Statistics.

Homework will be assigned and graded.
Several in-class and take home exams will be given.
The final will be a comprehensive take home exam.

Course Outline

1. **Introduction** and discussion of the problems from the August 2012 Ph. D. qual in Statistics.

2. **Statistical Experiments (Models)** (Ch. 2)
Parametric and nonparametric models.
Examples: exponential families, families with location/scale parameters.
Subexperiments and sufficiency.
Elements of statistical decision theory.

2. **Point Estimation in Small Samples** (Chs. 3, 4)
Methods and criteria of estimation.
Uniformly minimum variance unbiased estimators (UMVUEs) and Rao-Blackwell theorem. Completeness and Lehmann-Scheffé theorem.
Fisher information and Cramér-Rao inequality.
Estimation in linear models.
Bayesian approach.
Equivariance and Pitman estimators.

3. **Point Estimation in Large Samples** (Chs. 4, 5)
Asymptotic normality of method of moments and maximum likelihood estimators.
Estimating in nonparametric models. Statistical functionals. Estimators based on order statistics. Estimating equations. Projection methods. U-statistics as estimators.

4. **Testing Statistical Hypotheses** (Ch. 6)
Neyman-Pearson lemma. Uniformly most powerful tests.
Likelihood ratio tests.
Testing in nonparametric models.

5. **Elements of categorical data analysis and generalized linear models**