COURSE AND CONTACT INFORMATION
Course: Statistics 8258 Distribution Theory
Semester: Spring, 2015
Time: Monday, 6:10-8:40pm
Location: 2020 K St. (room 12).

INSTRUCTOR
Name: Professor Joseph L. Gastwirth
Campus Address: Department of Statistics, Rome Hall 801 22nd St. NW (#558)
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E-mail: jlgast@gwu.edu
Office hours: Monday 4:30-5:30pm; Wednesday 2:00-3:00 pm.
Tuesday by appointment

COURSE DESCRIPTION
1. Review of basic probability inequalities based on moments and some improvements that are possible when properties of the distribution function are known.

2. Measures of spread and measures of relative inequality and their relationship to the Lorenz curve.

3. Review of characteristic functions and their use. More detailed study of several commonly used functions of random variables in statistics, especially quotients of random variables.

4. Order statistics and their properties and introduction to non-parametric methods including:
   a. The Dirichlet distribution and the spacings between order statistics in a sample from a Uniform distribution.
   b. Pitman’s lemma and how it is utilized to study some functions of the spacing’s of a sample from a uniform distribution. The Renyi representation of the order statistics from an exponential distribution and its use in deriving related distributions.
   c. Properties of the Wilcoxon two sample test.

5. Basic results in large sample theory and their use. The asymptotic distribution theory of functions of random variables using the “delta” method will be illustrated. The theory will be compared to results using modern computational approaches e.g. simulation and the bootstrap.

Depending on the time it takes to cover the above topics, the course may also examine the effect of dependence on the sampling distributions of common estimators and test statistics or carry out a small research project.

COURSE PREREQUISITE(S)
Statistics 201-202 or the equivalent and Statistics 257 or sound knowledge of
the main theorems of probability, e.g. law of large numbers and central limit theorem for non-identically distributed random variables. Basic mathematical analysis, covered in the pre-requisite classes will also be used.

**TEXTS (recommended)**

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<tr>
<th>Author(s)</th>
<th>Title</th>
<th>Edition</th>
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<tbody>
<tr>
<td>R. Serfling</td>
<td>Approximation Theorems of Mathematical Statistics</td>
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Note: The first book has been the main textbook for the class; however, it is out of print. Copies of the relevant material will be handed out in class.

**LEARNING OUTCOMES:**
As a result of completing this course, students will be able to:
1. Derive the basic properties of the major statistical distributions.
2. Work with statistical procedures based on order statistics.
3. Work with percentile based curves, e.g. the Lorenz curve and associated measures of relative inequality, e.g. Gini Index and Coefficient of Dispersion.
4. Derive the large sample approximate distributions of commonly used statistics.

**GRADING**

Homework (20%)
Class Participation and Project/Presentation (40%)
Exam (40%)

**CLASS POLICIES**

Students are expected to attend class and turn in homework regularly and on time. Late homework will not be accepted as the problems will be discussed in class. Sometimes the class will be given an additional week to complete a problem, if the necessary material has not been covered sufficiently or we decide that more time is appropriate. An exam will be given on the last scheduled day of class and if possible, we will arrange a session to go over the exam, so you can learn any material you had difficulty with on the exam.

**Religious Holidays:** We will not meet on major holidays but will re-schedule at convenient time for everyone.

**General Policies:** We will follow the university policies with regard to teaching, retention of written work etc.

**ACADEMIC INTEGRITY**
I personally support the GW Code of Academic Integrity. It states: “Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information.” For the remainder of the code, see: [http://www.gwu.edu/~ntegrity/code.html](http://www.gwu.edu/~ntegrity/code.html)
SUPPORT FOR STUDENTS OUTSIDE THE CLASSROOM

DISABILITY SUPPORT SERVICES (DSS)
Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office at 202-994-8250 in the Marvin Center, Suite 242, to establish eligibility and to coordinate reasonable accommodations. For additional information please refer to: http://gwired.gwu.edu/dss/

UNIVERSITY COUNSELING CENTER (UCC) 202-994-5300
The University Counseling Center (UCC) offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. Services for students include:
- crisis and emergency mental health consultations
- confidential assessment, counseling services (individual and small group), and referrals
  http://gwired.gwu.edu/counsel/CounselingServices/AcademicSupportServices

SECURITY
In the case of an emergency, if at all possible, the class should shelter in place. If the building that the class is in is affected, follow the evacuation procedures for the building. After evacuation, seek shelter at a predetermined rendezvous location.