The George Washington University
Department of Statistics

STAT-6201: Mathematical Statistics
Fall 2016

Days: Thursday
Classroom: MON 114
Meeting Time: 6:10-8:40 p.m.

Instructor: Sanaa Kholfi
Office address: MON 114
Telephone: 202-236-4863 (Prefer text)
Email: sanaa.kholfi@gmail.com

Office hours: Thursdays: 4:15-6:10 or by Appointment

Grader: Chen Chen

Textbooks:

Required: Statistical Inference, by George Casella and Roger Berger, Edition 2nd
ISBN: 9780534243128

Recommended: Intro to Mathematical Statistics, by Robert V. Hogg, Joseph McKean, and Allen T Craig, Edition 7th
ISBN: 9780321795434

Scope:

This is the first part of a two semester course in Mathematical Statistics. Probability theory is presented as a mathematical foundation for statistical inference. Axiomatic probability is introduced then some standard discrete and continuous probability distributions are presented. Joint distributions and transformations are discussed. Probabilistic convergence concepts are introduced.

Prerequisites:

An introductory course in Statistics and/or probability can be helpful, but is not required. Familiarity with integral and differential calculus is assumed. For example, I expect everyone in the class to know \( \int x^6 \, dx \), \( \int e^{-x} \, dx \), \( \int \ln x \, dx \). Competence in basic algebra is expected, for example extraction of roots of
equations of the second and third degree and accurate manipulation of algebraic expressions are assumed to be in your background.

Topics:

<table>
<thead>
<tr>
<th>Date</th>
<th>Week</th>
<th>Topics</th>
</tr>
</thead>
</table>
| 9/1/2016   | Week 1 | Set Theory, Basic Probability Theory: 1.1, 1.2.1  
Basic Probability Theory: 1.2.2-1.2.4 |
| 9/8/2016   | Week 2 | Conditional Probability and Independence 1.3  
Random Variables, Distribution Functions: 1.4-1.5 |
| 9/15/2016  | Week 3 | Distribution Functions, Mass and Density Functions: 1.5-1.6 |
| 9/22/2016  | Week 4 | Distributions of Functions of a Random Variable: 2.1  
Expected Values: 2.2 |
| 9/29/2016  | Week 5 | Moments and Moment Generating Functions: 2.3  
Discrete Distributions: 3.2 |
| 10/6/2016  | Week 6 | Continuous Distributions: 3.3  
Exponential Families, Location and Scale Families: 3.4-3.5 |
| 10/13/2016 | Week 7 | Probability inequalities and identities: 3.6, 4.7 |
| 10/20/2016 | Week 8 | **Midterm** |
| 10/27/2016 | Week 9 | Joint and Marginal Distributions: 4.1  
Conditional Distributions and Independence: 4.2  
Bivariate Transformations: 4.3 |
| 11/3/2016  | Week 10 | Bivariate Transformations, Hierarchical Models and Mixture Distributions: 4.3 - 4.4 |
| 11/10/2016 | Week 11 | Covariance and Correlation: 4.5  
Multivariate Distributions: 4.6  
Inequalities: 4.7 |
| 11/17/2016 | Week 12 | Basic Concepts of Random Samples, Sums of Random Variables from a Random Sample: 5.1-5.2 |
| 11/24/2016 | Week 13 | No Class |
| 12/1/2016  | Week 14 | Sums of Random Variables from a Random Sample: 5.2 |
| 12/8/2016  | Week 15 | Order statistics: 5.4 |
| 12/15/2016 | Week 16 | **Final Exam** |

**Learning outcomes**

As a result of completing this course, students will be able to:

1. Make probabilistic arguments.
2. Formulate probabilistic models for science, engineering, economics, public policy and many other areas of application.
3. Have a global overview of the interplay between probability and statistics.
Grading Policy

1 Midterm (30%)
1 Final Exam (30%)
Quizzes (20%)
Weekly Homework (20%)

Note that these add up to a total of 100 percentage points.

Final grade will be based on: Final Semester Score = 20*HW + 20*Q + 30*M + 30*F)/100, where HW is the homework average, Q is the quiz average, M is the midterm score, and F is the final exam score (each out of 100). Grades will be assigned on the +/- scale.

Here is an example of what constitutes an A grade in this class. You score 95% or above: all homeworks and tests are solid and well done. You can miss a couple of problems here and there and still get an A.

NOTE: IN ACCORD WITH UNIVERSITY POLICY, THE FINAL EXAM WILL BE GIVEN DURING THE FINAL EXAM PERIOD AND NOT THE LAST WEEK OF THE SEMESTER

Class Policy

- Read the material that will be covered in class ahead of time
- Attend the class. If you cannot attend the class due to emergencies, please let me know as soon as possible. The student who did not attend the class is responsible for the materials covered and for obtaining all other information given that day in class, e.g., homework problems, due date, etc.
- Do and submit homework on time, late work will not be accepted.

Make-up exams: Except for medical cases (with proper documentation), there will absolutely be no make-ups, you missed an exam, you failed it.

Homework: You should feel free to discuss problems with your fellow students (please document on each assignment with whom you worked). However, you must write your own solutions, and copying homework from another student (past or present) is forbidden. The GWCode will apply to all assignments, both in and out of class.

Blackboard

Please check Blackboard frequently, as there may be assignments, announcements, and material passed to the class via this electronic medium during the week. You can find it at
You need to login, using your GW user ID and password.

For university policies on teaching, see

[http://www.gwu.edu/~academic/Teaching/main.htm](http://www.gwu.edu/~academic/Teaching/main.htm)

**Academic Integrity**

I 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)

Any case of the slightest hint of cheating will be prosecuted to the fullest extent of the university Academic Integrity Policy. You will receive an automatic F, and the case will be taken to the proper administrative channels.

**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/](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

See
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.