

The George Washington University
Department of Statistics

STAT-6201 Syllabus

Fall 2022

Day: Tuesday
Meeting Time: 6:10 pm -8:40pm
Classroom: Room 640 Phillips Hall

Instructor: Professor Joseph L. Gastwirth

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Office hours: To be determined with the class on our first day.

Textbook: *Statistical Inference*
by George Casella and Roger Berger

Scope:

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. Moment generating functions and their use will be illustrated. Joint distributions and transformations are discussed. Probabilistic convergence concepts are introduced and used to obtain large sample approximations for statistical estimators. Some applications of these concepts to real world applications, including the usefulness of statistical probabilities in monitoring discrimination against minorities will be discussed.

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 algebra and elementary matrix algebra is expected, for example extraction of roots of equations of quadratic equations and calculating the determinant of a 2x2 or 3x3 matrix are assumed.

Average minimum amount of out-of-class or independent learning expected per week:

Students are expected to spend a minimum of 5 or 6 hours studying and working homework problems each week to supplement the 2.5 hours of direct instruction, including lectures and class discussion.

Topics: Approximate Schedule

- WEEK 1: Introduction to statistics and probability, axioms
- WEEK 2: Combinatorial probability, Conditional probability
- WEEK 3: Law of total probability and Bayes theorem, independence, random variables
- WEEK 4: Discrete distributions and introduction to continuous distributions. Application of the binomial and hypergeometric distributions in jury discrimination cases.
- WEEK 5: Functions of random variables, expectation
- WEEK 6: Review of exam one and Moment generating functions
- WEEK 7: Continuous distributions
- WEEK 8: Probability inequalities, joint distributions
- WEEK 9: Bivariate transformations, mixtures
- WEEK 10: Covariance, correlation, multivariate distributions, review problems
- WEEK 11: Sums of independent random variables
- WEEK 12: The sampling distribution of important statistics.
- WEEK 13: Convergence concepts and central limit theorem, order statistics, (time permitting).
- WEEK 14: Continuation of WEEK 13 and review for the last exam

Homework will be assigned in each class after we see how much material we have covered. They will be due the following week. You will **not** be asked to do problems on material we have not covered. Any problem that requires that material will be due a week after we cover the necessary information.

Exam Schedule:

There will be one mid-term exam and a cumulative exam at the end of the semester. Both exams are cumulative. On the first day of class, we will decide on the dates of the exams. Before each exam, we expect to have a review session (assuming the class wants one).

Learning outcomes

After completing this course, students will be able to:

1. Make probabilistic arguments and basic calculations.
2. Calculate probabilities related to the many commonly used distributions, e.g. Binomial, Poisson, geometric, normal, chi-square and Gamma.
3. Understand the assumptions underlying probabilistic models for a variety of applications.
4. Have an overview of the interplay between probability and statistics.

Grading Policy

There will be two exams; the mid-term (25%) and the exam at the end of the semester (40%). Both exams will be **open book** and you will be allowed a one or two page “sheet of notes”. Homework will count 20% and attendance and class participation (15%). The lowest homework score will be dropped before a student’s average homework grade is calculated. On the first day of class, you will be given the option of allowing the weights to be modified to down-weight each student’s lowest grade. For example, if a student has a very low homework grade but does better in the exams, their homework grade will be down-weighted.

Each exam will have 105 points, so you can miss part of a problem and still obtain a grade in the A range.

Class Policies

Late work: Will not be accepted.

Make-up exams: Except for medical cases (with proper documentation), there will absolutely be no make-ups.

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 <http://blackboard.gwu.edu/webapps/portal/frameset.jsp>. Usually, you will receive an email if something important is placed on Blackboard.

<http://blackboard.gwu.edu/webapps/portal/frameset.jsp>

You need to login, using your GW user ID and password.

Some lectures and review sessions may be recorded. You should be aware of two special features:

1. Those lectures and review sessions that are audio/video recorded will be made available to other students in this course. As part of your participation in this course, you may be recorded. If you do not wish to be recorded, please contact [instructor/GW email address] the first week of class to discuss alternative arrangements.

2. Students are prohibited from recording/distributing any Class Activity without permission from the instructor, except as necessary as part of approved accommodations for students with disabilities. Any approved recordings and slides and lecture notes may only be used for the student’s own private use and not be copied or re-distributed by any means. The notes and slides are the intellectual property of the Professors and are protected by copyright law.

University policies:

University policy on observance of religious holidays

In accordance with University policy, students should notify faculty during the first week of the semester of their intention to be absent from class on their day(s) of religious observance. For details and policy, see: students.gwu.edu/accommodations-religious-holidays.

Academic integrity code

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 details and complete code, see: studentconduct.gwu.edu/code-academic-integrity

Safety and 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.

Inclusivity

Students of all backgrounds are encouraged to fully participate in class discussions. While most of the material covered in class is mathematical in nature, please inform the Professor if any example in the textbook or course materials is inappropriate.

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 Rome Hall, Suite 102, to establish eligibility and to coordinate reasonable accommodations. For additional information see: disabilitysupport.gwu.edu/

Mental Health Services 202-994-5300

The University's Mental Health Services 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. For additional information see: counselingcenter.gwu.edu/