

## Statistics 4157

### Introduction to Mathematical Statistics

Fall 2022

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Most likely, I will NOT be able to provide recorded videos. Therefore, it will be difficult to learn this course remotely. Please plan your new semester accordingly.

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Data arising from both experimental and observational studies and in a range of applications e.g. biomedical, pharmaceutical, social sciences, business, reliability etc. can be typically analyzed using probability and statistic tools. Introduction to Mathematical Statistics is a course aiming to provide the methodological background for more advanced study of statistical inference methods.

#### Course outline

- Introduction to probability: set notation, basic set operations, definition of probability, calculating the probability.
- Discussion of discrete random variables and distributions: probability distribution of a discrete random variable, expected value of a discrete random variable, variance of a discrete random variable, various discrete distributions.
- Discussion of continuous random variables and distributions: probability density function, probability distribution function, expected value of a continuous random variable, variance of a continuous random variable, various continuous distributions.
- Multivariate distributions: Bivariate random variables, joint probability density (mass) function, joint distribution function, marginal and conditional probability distribution (density or mass) function

## Textbook

Mathematical Statistics with Applications. 7<sup>th</sup> Edition. Wackerly, Mendenhall, and Scheaffer. BROOKS/COLE, CENGAGE Learning, Belmont, CA. ISBN-13: 978-0-495-11081-1; ISBN-10: 0-495-11081-7.

## Prerequisites:

Basic math and statistical courses.

## Learning Outcomes

1. Practice event (or set) operations: union, intersection, complement, etc.;
2. Calculate probability: counting, conditional probability, independence, multiplicative law of probability, additive law of probability;
3. Compute expectation, variance, probability mass function, probability distribution function of discrete random variables;
4. Compute expectation, variance, probability mass function, probability distribution function of discrete random variables;
5. Calculate joint probability density (mass) function, probability distribution function, marginal probability distribution function, conditional probability distribution function, expectation and variance under multivariate setting.

**Grading:** Your final letter grade will be based on weighted average: 35% Homework, 35% Midterm Exam, and 30% Final Exam.

No incomplete grades will be assigned for marginal or failing grades at the end of the semester. There will be no extra work available to improve your final grade. Your grade will be determined as outlined above. **There will be no exceptions.**

## Class Attendance

Class discussions will extend the materials covered in the textbook. Therefore, it is important that you attend the class. You are responsible for any materials covered or any announcements made in class, even if you are not present.

**Amount of Time on Direct and Independent Learning:** It is expected that students spend 150 minutes in classroom on lecture plus 300 minutes of independent learning per week.

**Homework:** Late homework will not be accepted.

## **Computing**

**Statistical Packages:** You will need to use a statistical package in order to perform most of the statistical analyses covered in this course. [R](#) is a freeware that we will use extensively in this course. Please google “download R” to download R 4.0.1 and install it to your computer. Please read the Appendix of the textbook for more information about downloading R.

## **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](http://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](http://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.

### **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/](http://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/](http://counselingcenter.gwu.edu/)

#### **Please note:**

1. Please go to blackboard to find various course components.
2. You need to meet minimum technology requirements for participation in the course.
3. Please visit the following website to get support (e.g., technical requirements and support, student services, obtaining a GWorld card, and state contact information) at [online.gwu.edu/student-support](http://online.gwu.edu/student-support)

#### **Copy-Right and Privacy:**

*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 may only be used for the student's own private use.*