

The George Washington University

Department of Statistics

STAT-1000 Dean's Seminar

The Science of Uncertainty

Fall 2023

Syllabus

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|------------------------|--|
| Days: | Tuesday and Thursday |
| Meeting Time: | 2:20-3:35 p.m. |
| Meeting Place: | TOMP 306 |
| Instructor: | Hosam M. Mahmoud, Professor |
| Office address: | 801 22 nd Street, Room 770 |
| Telephone: | (202) 9946-6667 |
| Email: | hosam@gwu.edu |
| Office hours: | 4:00-5:15 Tuesday, also available by appointment |

Textbooks:

A Student-Friendly Introduction to Probability
by Mark Daniel Ward and Ellen Gundlach

Supplementary reading:

Chance (2004), by Amir Aczel. Thunder's Mouth Press, New York.

Scope:

Probability and the calculus of chance are presented at an introductory level. Axiomatic probability is introduced. Some fun scenarios, such as poker, urn schemes and paradoxes are brought to the fore, and then some standard discrete and continuous probability distributions are presented. The course touches on elements of estimation and predictions. Elements of stochastic behavior are discussed.

Topics:

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| WEEK 1: | Getting to know each other: motivation, philosophy, periphery, notation |
| WEEK 2: | Probability axioms |
| WEEK 3: | Quiz 1, laws of probability |
| WEEK 4: | Combinatorial probability |
| WEEK 5: | Quiz 2, Poker, urns, board games |
| WEEK 6: | Midterm, concepts of distributions, mass function, density |
| WEEK 7: | Discrete distributions: uniform, binomial |
| WEEK 8: | Quiz 3, Discrete distributions: geometric, Poisson |
| WEEK 9: | Continuous distributions: uniform, normal |
| WEEK 10: | Quiz 4, Continuous distributions: normal |
| WEEK 11: | Concepts of statistical inference |
| WEEK 12: | Point estimation, interval estimation |
| WEEK 13: | project presentation |
| WEEK 14: | project presentation |

Prerequisites:

High school algebra and precalculus. Competence in basic algebra is expected, for example, extraction of roots of equations of quadratic equations and accurate manipulation of algebraic expressions are assumed to be in your background.

Learning outcomes

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

1. Make probabilistic arguments.

GPAC component: Articulate precise mathematical definitions and propositions and draw inferences from them.

Addressing this component: Reading off possibilities in experiments and endowing them with quantified measures of uncertainty.

2. Formulate stochastic models for science, engineering, economics, public policy and many other areas of application.

GPAC component: Represent mathematical information symbolically, visually, numerically, and verbally

Addressing this component: Extracting models from real-life scenarios, articulating applications as equations, formulas, graphs and mathematical inequalities.

3. Develop appreciation for stochastic thinking.

GPAC component: Interpret and explain information represented in mathematical forms (e.g., graphs, equations, diagrams, tables)

Addressing this component: Constructing, inspecting and interpreting data for decision making. Histograms are a good example of this.

4. Train more in the manipulation of numbers and equations.

GPAC component: Use algebraic, geometric, or statistical calculations to solve problems

Addressing this component: Solving equations, looking into new types of equations like cubic and Diophantine.

Grading Policy

1 Midterm (15%)

1 Final (25%)

4 Quizzes (5% each)

about 6-8 homeworks (25%)

project presentation (20%)

Note that these add up to a total of 105 percentage points!.

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.

Class Policy

Late work: Will not be accepted.

Make-up exams: Except for medical cases (with proper documentation), there will 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>

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>

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>

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/>

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>

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:

provost.gwu.edu/policies-procedures-and-guidelines

Support for students outside the classroom

Disability Support Services (DSS) 202-994-8250 Any student who may need an accommodation based on the potential impact of a disability should contact Disability Support Services in Rome Hall, 801 22nd Street, NW, Suite 102, to establish eligibility and to coordinate reasonable accommodations. For additional information see:

disabilitysupport.gwu.edu

Counseling and Psychological Services 202-994-5300

GW's Colonial Health Center offers counseling and psychological services, supporting mental health and personal development by collaborating directly with students to overcome challenges and difficulties that may interfere with academic, emotional, and personal success. For additional information see

healthcenter.gwu.edu/counseling-and-psychological-services.

In an emergency: call GWPD 202-994-6111 or 911. For situation-specific actions: review the Emergency Response Handbook:

safety.gwu.edu/emergencyresponse-handbook