

## Math 2140: Introduction to Mathematical Statistics – Summer 2025 Main First Session

Instructor: Assistant Teaching Professor Matthew A. Hawks

Meetings: M/T/W/R 8:30 am – 10:30 am @ Car Barn 301

Email Address: [mh2315@georgetown.edu](mailto:mh2315@georgetown.edu)

Office Hours: M/T/W/R 10:45 am – 12:00 pm @ Car Barn patio and by appointment

Welcome: I am excited and privileged to be your instructor for Intro Math Stats! My love for my God, my family, and this world motivates me to do my utmost to make you the best scholars and citizens you can be. As a professor, I acknowledge that I can suffer from expert blindness and the curse of knowledge. Do not hesitate to speak up or see me if you have a suggestion, problem, or misunderstanding of any kind. I especially want to know if you are not able to see or hear something you should be seeing or hearing. It will take effort from all of us to develop your critical-thinking and problem-solving skills as we model uncertainty and perform statistical analyses.

Cura Personalis: We will have mutual respect - not only from student to instructor and from instructor to student, but also from student to student. I will establish a challenging yet supportive learning environment, where we seek to honor each other's inherent value.

- Unless we have broken into groups, the classroom features one conversation at a time.
- We won't belittle people for asking questions or expressing opinions.
- Debates and critical analysis are good; personal attacks are not.
- We won't use profanity, nor tolerate crude or sexually explicit jokes or remarks.
- We will put phones away and close email and social media sites during class.
- I will endeavor to get to know you by your first (or preferred) names; you might call me Professor, Sir, or Dr. Hawks.

I fundamentally believe that teaching requires trust. "And what you have heard from me in the presence of many witnesses, entrust to faithful [people], who will then be able to teach others also." (2 Timothy 2:2, ESV, © 2001 Crossway Bibles) In the interest of establishing trust, most class days will include an optional daily question. I have found this practice improves the classroom community and the learning environment.

I am still in the process of learning about diverse perspectives and identities. If anyone says or does something in class that makes you feel uncomfortable, please talk to me about it. If you prefer to speak with someone outside of the course, my supervisor is the Department Chair of Mathematics and Statistics, Prof. Mahlet Tadesse, [mgt26@georgetown.edu](mailto:mgt26@georgetown.edu).

I provide my email to facilitate contact anytime, because scholarly excellence goes beyond Monday through Friday. If you see me for office hours, I expect you to come with questions about the course that show that you are actively engaged with the material.

Course Info: This course introduces probability theory and statistical inference. The first half of the course introduces fundamentals in probability, including basic probability rules, properties of random variables, discrete and continuous distribution functions, and expected values and variance. The second half of the course focuses on the core of statistical inference and deals with the central limit theorem, point estimation, confidence intervals, hypothesis testing, and finally

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the linear regression model. The statistical software R will be used to illustrate concepts and to perform data analysis. This course has a prerequisite of MATH 1360 or equivalent and cannot be taken if the student has already taken ECON 2110 or DSAN 5100.

Course Objectives: By the end of this course, students are expected to confidently state:

- I understand the basic probability theories underlying statistical inference
- I can perform introductory data analysis, including confidence intervals, hypothesis testing, and regression analysis
- I can critically assess and communicate statistical results and inferences orally and in writing to a range of audiences
- I appreciate the varied backgrounds of my classmates

Put in the reps and the time. As in most fundamental mathematics courses, going over key concepts and doing lots of problems is integral for success in this course. The summer course schedule is nearly optimal, as success in a mathematics course takes near-daily review and practice. Frequent touches with course material are important in probability and statistics; the unintuitive concepts require different analysis than differential and integral calculus. This course will move fast – be sure to reach out at the first sign of misunderstanding.

Recommended Textbooks: I will draw from a variety of sources.

- Wackerly, Mendenhall, Scheaffer, Mathematical Statistics with Applications, 7th Ed. Brooks/Cole (ISBN 978-0-495-11081-1).
- Navidi, W. C., Statistics for Engineers and Scientists, 5th Ed. McGraw-Hill Education (ISBN 978-1-259-71760-4).

R Statistical Computing Software: This course will utilize the R statistical computing software, run in the integrated development environment RStudio. This software does not require a license and thus is free of charge. Students should install this software on their computers on their own time during the first week of class. Installation tutorials for Windows and Mac environments are available at these links:

[How to download R and install RStudio on Windows 10 2021 - YouTube](#)  
[How to install R and RStudio on Mac in 4 minutes \(August 2021\) - YouTube](#)

Course Website: This course will make use of Canvas. Please check it every day for updates.

Grading: I use the following scheme to determine your course grade:

~Daily Mini-quizzes:	5%	
~Twice weekly homework:	25%	mostly due noon Tuesdays & Thursdays
Two Midterms:	40%	Midterm I: Thu 6/12 Midterm II: Thu 6/26
Final Exam:	30%	Thu 7/3

I use the following grade cutoffs:

A $\geq$ 93%	A- $\geq$ 90%	B+ $\geq$ 87%	B $\geq$ 83%	B- $\geq$ 80%	
C+ $\geq$ 77%	C $\geq$ 73%	C- $\geq$ 70%	D+ $\geq$ 67%	D $\geq$ 60%	F < 60%

Mini-quizzes: Administered at the start of class, mini-quizzes will serve both to recap previous concepts and to assess your pre-knowledge of the material to be covered in that day's lecture. Mini-quiz scoring is based on participation, not performance. No makeups will be given.

Problem Sets: Problem sets constitute a very important part of your study. You are welcome to work with each other; however, when you turn in your homework, you are responsible for turning in your own solutions. Copying someone else's work does not prepare you for exams, so even if we don't detect an instance of cheating, it will only hurt your grade more than it helps.

*I do not accept late or sloppy homework.* Homework is due at noon, but sometimes the internet does not cooperate. I will not accept homework submitted after 1:00 pm. I drop your lowest homework grade when computing your course grade.

Exams: There will be two midterm exams on the dates outlined above, as well as a final exam. All exams will be administered in class and will be closed book and closed notes – apart from a self-produced two-sided cheat sheet. You will need a calculator; however, the use of a computer or a smartphone is prohibited. *A student who misses an exam without prior approval from the instructor or medical evidence justifying the absence will receive a grade of zero for the exam.*

You must let me know before the exams if you cannot attend one, and makeup exams will only be provided if you have a valid excuse (medical, family emergency, or participation in university-sanctioned event) with appropriate documentation.

Academic Integrity: As signatories to the Georgetown University Honor Pledge, and simply as good scholars and citizens, you are required to uphold academic honesty in all aspects of this course. You are expected to be familiar with the letter and spirit of the Standards of Conduct outlined in the Georgetown Honor System and on the Honor Council website (<https://honorcouncil.georgetown.edu/>). As a faculty member, I too am obligated to uphold the Honor System and will report all suspected cases of academic dishonesty.

Support for Students Outside of the Classroom: Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office to establish eligibility and to coordinate reasonable accommodations. For additional information please refer to: <https://academicsupport.georgetown.edu/disability/>

Security: In the case of an emergency, if 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.

Sexual Misconduct: Georgetown University and its faculty and staff are committed to supporting survivors and those impacted by sexual misconduct, which includes sexual assault, sexual harassment, relationship violence, and stalking. Georgetown requires faculty members, unless otherwise designated as confidential, to report all disclosures of sexual misconduct to the University Title IX Coordinator or a Deputy Title IX Coordinator. If you disclose an incident of sexual misconduct to a professor or staff member in or outside of the classroom (apart from disclosures in papers), that faculty or staff member must report the incident to the Title IX

Coordinator, or Deputy Title IX Coordinator. The coordinator will, in turn, reach out to the student to provide support, resources, and the option to meet. Please note that the student is not required to meet with the Title IX coordinator and no action will be taken without the student's awareness. More information about reporting options and resources can be found on the Sexual Misconduct Website: <https://sexualassault.georgetown.edu/resourcecenter>.

If you would prefer to speak to someone confidentially, Georgetown has a few fully confidential professional resources that can provide support and assistance. These resources include:

- Health Education Services: Sexual Assault Response and Prevention: [sarp@georgetown.edu](mailto:sarp@georgetown.edu)
- Counseling and Psychiatric Services (CAPS): 202.687.6985

Additional resources include:

- Georgetown Self-Care Resource Guide: <https://studenthealth.georgetown.edu/health-promotion/self-care/>
- Georgetown Wellness Wheel: <https://studenthealth.georgetown.edu/hoya-wellness-wheel/>
- Georgetown Guide to Recognizing Students in Distress: <https://studentaffairs.georgetown.edu/studentoutreach/facultystaffresources/>

Pregnancy Modifications and Adjustments: Georgetown University is committed to creating an accessible and inclusive environment for pregnant students. At any point throughout their pregnancy students may request adjustments/modifications based on general pregnancy needs or accommodations based on a pregnancy-related complication or medical need. Students may also request accommodations following labor and delivery based on a complication or medical need.

To request pregnancy modifications, please complete the [SCS Pregnancy Modification Request Form](https://forms.gle/ZBfASxui7u13A8TU6): <https://forms.gle/ZBfASxui7u13A8TU6>. More information about pregnancy modifications can be found on the Title IX Georgetown University Website: <https://titleix.georgetown.edu/title-ix-pregnancy/student-pregnancy/>

Schedule: Below is a *tentative* schedule for the course. It is subject to slight changes depending on the amount of material covered each day. I strongly encourage you to skim the reading before class, so you are familiar with the definitions, concepts, and the statements of the material we'll cover that day. I am indicating applicable sections from the *WMS* and the **Navidi** texts.

Week 1 – Introduction to experiments, outcomes, sets, probability, combinatorics, conditional probability, independence, Bayes' Rule (2.1-2.10, 2.1-2.4)

Week 2 – Random variables (2.11, 3.1-3.8, 4.1-4.6, 2.5, 4.1-4.5, 4.7-4.8)

Week 3 – Central Limit Theorem, properties of estimators (7.3, 9.1-9.2, 9.6-9.7, 4.9, 4.11)

Week 4 – Interval estimation and hypothesis testing (8.5-8.8, 10.1-10.8, 5.1-5.6, 6.1-6.8)

Week 5 – Introduction to Regression (11.1-11.9, 7.1-7.3)

Important Dates:

No Class – Thursday 6/19

Exam I – Thursday 6/12

Exam II – Thursday 6/26

Final Exam – Thursday 7/3 @ 9:00 am