

# MATH 140 – Introduction to Mathematical Statistics

## MTWR 1:10 pm – 3:15 pm White-Gravenor 213

### Summer 2022

**Instructor:** Dr. K. Nicole Meyer  
312 St. Mary's Hall  
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**Class meetings:** Mondays, Tuesdays, Wednesdays, and Thursdays  
1:10-3:15 pm in White-Gravenor 213

### Office Hours:

Office hours are a key part of this course -- students who do well in the course typically attend office hours frequently. Any time you are feeling lost, stuck, or confused, you should come to office hours. I will be available to meet either in person in my office (St. Mary's 312) or over Zoom at a wide variety of times throughout the week. Please [use my Google calendar](#) to make an appointment.

### Course Format:

There will typically be three components to our course meetings – a quiz, a lecture, and a group assignment. The meeting will typically start with a short quiz, followed by a lecture. During the lecture component, I will discuss course material and give students in attendance the opportunity to ask questions. I will record the lecture component and post it to our Canvas site after the meeting. If you do not attend the meeting, you should watch the recorded lecture.

Following the lecture, there will typically be a group assignment. I will distribute an assignment related to the lecture and split attending students into small groups to complete that assignment, which you will then submit either at the end of class or at the beginning of the next class. After the class period, the assignment will also be made available through Canvas. If you are absent from class, you should use the use the Canvas version of the assignment to complete the assigned work individually (or, if available, other students who were also absent).

**Required text:** *Mathematical Statistics with Applications* (7<sup>th</sup> edition) by Wackerly, Mendenhall, and Scheaffer (ISBN: 9780495110811)

**Note 1:** This book is available as an online rental or purchase through [VitalSource](#) and [Amazon](#)

**Note 2:** Please verify that you have the correct edition of the textbook by comparing the ISBN (International Standard Book Number, found on the copyright page, near the front cover) of your book to the ISBN given above. If you have a different ISBN, then you have a different version of the text, even if it has the same title and is listed as the 7<sup>th</sup> edition. If you have a different version of the textbook, you will need to exercise care when completing the assigned homework as different versions of the textbook frequently have different exercises or the same exercises with different numbers. To ensure that you are completing the assigned exercises, either consult with another student who has the correct version or consult the copy of the text which is kept on course reserves with the Bloomer Science Library (Reiss 302).

**Required software:** Minitab (available at no cost through UIS – <http://uis.georgetown.edu>), Stata, or R (see note below)

**Software note:** The traditional software used in this course has been Minitab, which is free to Georgetown students and has a simple, easy-to-use graphical interface. Most students will find this to be the simplest tool to use in completing course requirements and detailed instructions on the use of Minitab will be provided in this course.

If you take more advanced statistics courses, you will begin using the statistical programming language R. If you want to use R for this course, you are welcome to do so and your instructor will be glad to give you instruction in using R. Students who are taking this course in lieu of ECON 121 and intend to later take ECON 122 may wish to instead use Stata to complete course requirements, as Stata is used in both ECON 121 and ECON 122. Tutors in the Economics department are available to assist you in the use of Stata during Spring and Fall semesters, but this may not be available in the summer.

If you are already familiar with another statistical program, you are welcome to use it to fulfill course requirements, but be advised that your instructor may be able to offer only limited guidance on the use of other tools.

**Prerequisite:** Calculus II is a prerequisite for this course. Multiple tools from Calculus I and II (including the fundamental theorem of Calculus, optimization of functions, integration by parts, evaluation of geometric series, Taylor series expansions, Taylor's remainder theorem, and differentiation/integration of convergent power series) will be employed throughout the course. If you have not taken Calculus II and have somehow managed to enroll in this course anyway, you should immediately drop this course and enroll in Calculus II instead.

## Course Description and Goals:

This course introduces basic concepts in probability theory and applied statistics. Topics to be covered include methods of enumeration, properties of random variables, common discrete and continuous distributions, expectations, the central limit theorem, parameter estimation, confidence intervals, hypothesis testing, and (if time permits) linear regression and the analysis of variance. Concepts will be illustrated and applied to data using the statistical package Minitab. The overarching learning goal for this course is for students to gain an appreciation of probability and statistics and its significance in a wide array of disciplines and applications. As a result, students successfully completing this course will be able to:

- gain understanding and comprehension about the statistical theories and topics listed above
- perform probability and statistical computations using technology
- communicate statistical results and inferences in appropriate contexts both orally and in writing

To accomplish these goals, the student will complete analytical and computational assignments, with reasonable performance on course examinations. Students willing to devote sufficient time to this course will be rewarded by sufficient introductory comprehension of probability and statistical concepts, with satisfactory prerequisite knowledge for entry into subsequent undergraduate statistics courses.

# Course Organization and Assignments:

**Preparatory Assignments** – Before each class period, you will be expected to complete a preparatory assignment consisting of textbook readings, mainstream media readings, scientific article readings, instructional videos, and homework exercises. Each preparatory assignment is designed with the intention that it will take you approximately 3 to 4 hours to complete. Your understanding of the material from the preparatory assignment may be assessed during the class period for which it was assigned or during any subsequent class period.

To get the maximal value from these assignments, you should complete the readings and watch the videos before attempting the exercises. Solutions to some of the assigned exercises will be posted. I highly recommend attempting the exercises before examining the solutions. It is expected that you will come to class with an understanding of how to complete the assigned exercises. If you are unable to successfully complete the assigned exercises, you should consult with your instructor in office hours. You should begin the preparatory exercises far enough in advance to allow time to meet with your instructor about any points of confusion before the associated class period.

You are welcome (and encouraged!) to work with your classmates while completing the preparatory assignments.

**In-Class Work** – During most class periods, you will be assigned group work which will be collected either at the end of that class period or at the beginning of the subsequent period. Each in-class assignment will be worth 10 points, and your highest 10 scores will be totaled to yield your in-class score (maximum score: 100 points).

**Quizzes** – Most class periods will either begin or end with a short, closed-book quiz. The quiz will cover either the material from the preparatory assignments, the in-class lectures, or some combination thereof. Each quiz will be worth 10 points, and your highest 10 scores will be totaled to yield your quiz score (maximum score: 100 points).

**Unit Exams** – There will be 2 in-class unit exams and one final exam. The first unit exam will cover descriptive statistics, combinatorial probability and probability laws, and discrete probability distributions; it will be worth 200 points. The second unit exam will cover continuous probability distributions, sampling distributions and the central limit theorem, and estimation procedures; it will be worth 200 points. The final exam will be cumulative, covering all course material; it will be worth 500 points. Dates for the exams are as follows:

Exam 1:	16 June
Exam 2:	30 June
Final Exam:	7 July, last day of course

## Exam Policies:

All exams will consist of two components: a core competencies section and a technical skills section. The core competencies section will be worth 25% of the available points on each exam and will consist of exercises testing your understanding of the basic elements of the exam material. This may include definitional/vocabulary questions, elementary computations, and questions testing basic understanding of key theorems. All students should be able to score 100% on this section. Students who score under 80% on this section will be assessed as lacking foundational understanding of the exam material and will be ineligible to receive any points on the technical skills section.

The technical skills section will be worth 75% of the available points on each exam and will consist of more high-level exercises, including writing proofs, deriving standard results/distributions, advanced computations, and detailed explication of theorems. A student's work on this section will only be assessed and points awarded only if they score at least 80% on the core competencies section.

All exams in this class are individual, closed-book exams which will be completed without the use of a calculator. The use of any electronic device (e.g., calculators, cell phones, pagers, tablets) during exams is strictly prohibited. You will be provided with a formula sheet to reference during exams. The use of any other reference material (e.g., textbooks, class notes) during exams is strictly prohibited. Communication through any means (verbal, visual, written, or otherwise) with any individual other than the course instructor during exams is also prohibited.

Students are expected to be present for all examinations. If an unforeseen emergency (medical or otherwise) prevents you from being present during an exam, you must provide documented evidence of that event in order to take a makeup exam and should communicate with your instructor regarding your absence as soon as possible. Other reasons for missing an exam should be discussed as soon as possible (definitely prior to the exam) with the instructor and will be considered on an individual basis. A student who misses an exam without a valid, documented excuse or prior approval of the instructor will receive a score of zero on that exam.

**Website:** Course materials (including this syllabus, assigned readings/videos, homework assignments and due dates, data sets, and supplementary notes) will be posted to the course website on Canvas (<http://canvas.georgetown.edu>). Any announcements and updates will also be posted to this site.

**Grade Determination:** At the end of the semester, your scores from all categories (in-class score work, quiz score, unit exam scores, final exam score) will be added together and converted to a letter grade using the following scale:

950 or more points:	A
900-949 points:	A-
870-899 points:	B+
830-869 points:	B
800-829 points:	B-
770-799 points:	C+
730-769 points:	C
700-729 points:	C-
670-699 points:	D+
600-669 points:	D
Under 600 points:	F

Please note that it is possible to earn 1100 points in this class. As such, the scale set forth above should be considered to be set in stone; no further "curving" will be performed, and no extra credit will be given.

## Course Policies:

**Email Policy:** Any email sent to your instructor should be regarded as professional communication and should be composed as such. In particular, all emails should contain an appropriate greeting and ending as well as an identification of yourself and the class (including section number) about which you are writing. Emails should not contain texting abbreviations, acronyms, or slang. Emails that do not meet these standards may not be answered. Emails that do meet these standards will generally be answered within one business day. If you have not received a reply within one business day, please send another email to follow up. When following up, please send a new email in which you mention your previous email – do not simply resend the original email.

As a matter of policy and to ensure compliance with federal laws governing the confidentiality of educational records, grades will not be discussed over email. You may use email to schedule a time to discuss your grades in person, but should not expect that any grade-related matter will be discussed or resolved over email. Emails requesting grade-related information may not be answered.

Before sending an email about a matter of course policy or logistics, please verify that the information you seek is not contained in this syllabus and has not been announced on the course website. Emails seeking information which is either contained in the syllabus or posted on the course website may not be answered.

**Record Keeping Policy:** Grades for individual assignments will be posted to the course website. It is your responsibility to monitor your records and alert the instructor to any mistakes in a timely fashion. Any disputes about recorded grades should be addressed with the instructor within one week from the day on which an assignment was returned. All disputes about recorded grades *must* be addressed before the day and time of the final exam.

**Standards of Conduct:** As signatories to the Georgetown Student Pledge and as upstanding scholars and citizens, you are expected to adhere to the highest standards of academic honesty in all aspects of this course. As with all your courses, it is your responsibility to be familiar with and in compliance with the standards laid out by the Georgetown Honor Council, which are more fully explicated at <https://honorcouncil.georgetown.edu/> All instances of academic misconduct will be reported to and investigated by the Honor Council.

**Disability:** If you have any type of disability (physical or mental, temporary or permanent) which interferes with the regular completion of course requirements, please inform your instructor with regard to the accommodations necessary to facilitate your success in this course. All reasonable requests for accommodations due to disability will be honored. Depending on the requested accommodation, you may need to obtain documentation of your disability and the necessity of your requested accommodation through the Academic Resources Center (ARC). See <https://academicsupport.georgetown.edu/disability> for further information on working with ARC.

Please do not hesitate to request accommodation from your professor even if you are unable to obtain documentation through ARC. It is my goal for this course to be fully accessible to all enrolled students. If I am ever falling short of that goal, I urge you to inform me immediately.