MA 2611 – Applied Statistics I

Innovation Studio 205
M/T/R/F 10:00 AM – 10:50 AM

Professor Carly Siegel Thorp (she/her/hers)

Email: cthorp@wpi.edu **Office**: Stratton Hall 413
"Ask Questions" Hours: Mondays / Thursdays 11am-12pm and Tuesdays 12pm-1pm or by appointment

Why is a course on statistics important?

Statistics are **everywhere**. From social media to sportscasts to politics, you will find statistics in your everyday lives. You will also find statistics in your future careers and, by taking this course to understand its basic tools and applications, you will develop a greater appreciation for an often-underestimated field. My hope is you leave this course with a foundational understanding of statistics, why it is an important field of application, how to use statistics wisely, and, maybe, an interest in taking additional courses in statistics (such as a minor in statistics?).

What does this course cover?

This course is designed as an introduction to applied statistics, with no prior knowledge of statistics required, but a working knowledge of algebra and understanding of calculus integration is assumed.

By the end of this course, you should be able to:

- ◊ Construct data into descriptive statistics and distinguish between different types of data.
- ◊ Develop the ideal graphical tools for summarizing numerical and categorical data.
- ◊ Understand sampling error and bias and define data sampling terminology.
- ◊ Distinguish the property differences between discrete and continuous distributions; calculate probabilities for discrete and continuous distributions.
- ◊ Execute and interpret confidence intervals in one and two sample scenarios.
- ◊ Explain how to conduct a hypothesis test and interpret the results for one and two sample cases; define and identify the two types of statistical errors.
- ◊ Recognize how to apply learned statistical methods to a variety of realistic scenarios.

Refer to the "Course Need-to-Knows" module on Canvas for a more detailed list of the learning objectives.

Statistics Reference Materials

While the course does not have a *required* textbook, if you are interested in delving a bit more into statistics or want a reference for the course, I recommend the following:

- ◊ Books on learning R that will, hopefully, not become coffee table books:
  - *The Book of R: A First Course in Programming and Statistics* by Tilman M. Davies
  - *Learning R: A Step-by-Step Function Guide to Data Analysis* by Richard Cotton
  - *R Cookbook: Proven Recipes for Data Analysis, Statistics, & Graphics* by J.D. Long & Paul Teetor
  - *R Graphics Cookbook: Practical Recipes for Visualizing Data* by Winston Chang
- ◊ Books on statistics for a bit of lighter, bedtime reading:
  - *Naked Statistics: Stripping the Dread from the Data* by Charles Wheelan
  - *The Lady Tasting Tea: How Statistics Revolutionized Science in the 20th Century* by David Salsburg

Assignments, Exams, Individual Final "Project," and Metacognitive Reflections

Throughout the term, there will be a variety of opportunities to demonstrate an understanding of the material learned and meet the requirements for your desired grade in the course. Additionally, you will be required to complete a series of reflections throughout the term, which use metacognitive techniques to help enhance your awareness and learning capabilities.

The first group of assignments are those which will be used to meet most of your grade:

- Concept Checks: These will focus on checking your foundational knowledge (e.g., terminology). Once available on Canvas, you will have until the end of the term to submit for credit. However, I ***strongly*** encourage you to complete each one within the first week of its availability to stay on track with processing and understanding the material covered, rather than waiting until the end of the term to meet the requirements for your intended grade!

  You will be allowed 2 attempts for each concept check, but, once started, you will have an hour to submit, as you would a quiz, unless an approved accommodation applies. Additional attempts may be requested via the usage of a token (see the "Tokens" section below for further details).

- Application Assignments: These will focus on evaluating your ability to apply the material covered to realistic problem scenarios.

Each of these assignments will have a **soft** deadline (the due date on Canvas) and **hard** deadline (3 days after the due date on Canvas). For example, if the deadline in Canvas is September 12, 2025, at 11:59 pm, then you have until September 15, 2025, at 11:59 pm, to submit the assignment before it closes on Canvas. If you are unable to submit your assignment by the **hard** deadline, you may use a token for an additional 24-hour extension (see the "Tokens" section below for further details).

- **Lab Assignments**: These will focus on evaluating what you learned in your lab activities and will use the material covered in class in conjunction with *R* and *RStudio*.

  Like the application assignments, each of these assignments will have a **soft** deadline (the due date on Canvas) and **hard** deadline (3 days after the due date on Canvas). If you are unable to submit your assignment by the **hard** deadline, you may use a token for an additional 24-hour extension (see the "Tokens" section below for further details).

The second group of assignments consist of your exams and your final individual project, assigned in lieu of a final exam. There will be two comprehensive exams, held in class on the following dates.

Exam	Date
Exam 1	Tues. September 9, 2025
Exam 2	Thurs. October 2, 2025

Following each exam, you will be provided the **optional** opportunity to revise and redo those questions/problems on which you made errors. Further details on the revision process can be found in the "Exam Revision Criteria" below and will be provided after your exams are graded.

For your final individual "project," you will be tasked with creating a **cumulative** final exam (plus answer key) that can be completed in 50 minutes, as if you are the professor, which contains unique questions that address a variety of topics covered throughout the course. Further details and the grading rubric will be provided later in the term on Canvas.

The last group of assignments are metacognitive self-reflections and there will be 3 of these over the course of the term, at the start, middle, and end. The intent of these is to help you assess your progress in the course by using a variety of metacognitive tools. These will be assessed as "Complete" or "Incomplete" and are due **within one week of becoming available** on Canvas.

Grading Methodology

This course will be using traditional grading methods with an alternative grading twist. While the way in which your final grade is calculated using traditional grading methodology (see the following section on your final grade breakdown), revisions and flexibility are built into the course, along with metacognitive tools to create an environment that allows **you** to successfully learn the material.

Throughout the term, I encourage you to keep track of the learning objectives you have met, using the Excel spreadsheet linked on the course Canvas page. This will not only help you with tracking your learning progress in the class, but it will also allow you to maintain awareness of what topics or material you may need additional guidance understanding.

Course Final Grade Breakdown

Here is a breakdown of how your final grade will be calculated:

	% of Grade
Application Assignments	30%
Exams + Final "Project"	25%
Lab Assignments	20%
Concept Checks	15%
Reflections	10%

A: [87%, 100%], B: [77%, 86%], C: [60%, 76%], NR: Below 60%

Additionally, to receive a passing grade in the course, **all** assignments, exams, and reflections must be completed and submitted, with a bit of flexibility on the weekly concept checks.

By the end of term, to receive an/a:

- A: must complete all 6 concept checks
- B: must complete at least 5 (out of 6) concept checks
- C: must complete at least 3 (out of 6) concept checks

I reserve the right to modify the above grading criteria, but not to lower the grade you would have received. If your grade does not meet the minimum criteria for a "C," then you will receive an "NR" as your final grade.

Tokens

To allow a bit of flexibility throughout the term, you will be granted 3 tokens at the beginning of the term, with opportunities to earn more, which can be put towards the following:

- ◊ 24-hour extensions on any of your assignments, *except* for the exams, exam revisions, and final individual project. Requests for extensions must be submitted **before** the hard deadline (when the assignment closes in Canvas).
- ◊ An additional attempt on a concept check (you are currently allowed 2 attempts).
- ◊ **Additional** revisions of an exam; requests must be submitted **within 24 hours** after your feedback on the exam revisions has been returned.
- ◊ Any other bending of the course rules you might want – just discuss with me first!

Token requests **must be submitted** via the Google form found here and on the Canvas course page under "Course Need-to-Knows." Requests submitted via email will **not** be accepted.

Exam Revision Criteria

You will be provided the opportunity to revise both of your exams and detailed revision instructions will be provided following the return of each exam. However, for the opportunity to receive back full credit on a question/problem, your revised exam must be provided with the following:

- ◊ Clearly stated which questions/problems you are revising on your exam.
- ◊ A detailed explanation explaining ***why*** the relative problem needs to be revised (e.g., if a t-test was analyzed incorrectly, specify how it was analyzed incorrectly).
- ◊ Your revised work on each problem, including explanations, calculations, coding input / output, etc…as applicable to the problem context.

Lab Software Requirements

For your lab activities and assignments, the software you will be using is *R* with *RStudio*.

Why *R* and *RStudio*? Well, for a couple of reasons…

First, it's free and open source, which makes it easily accessible for anybody, no matter what field they are studying or where they are working. Secondly, because it is open source, it is the primary

software used by researchers and statisticians, so many of you will find it useful in your future studies and careers. Plus, it never hurts to add a new skill your resume!

Other statistical software packages are used within a variety of industries, some of which you may encounter in your careers, such as Minitab, JMP, and SAS. Additionally, Microsoft Excel can be used to conduct basic statistical calculations and create graphical visualizations but is generally not recommended if other statistical programs are available.

Refer to the "Course Need-to-Knows" module on Canvas for instructions on installing R and RStudio.

Course Communication

The best method of communication for directly contacting me or your TA is **through email**. However, any announcements, assignments, or any other information you need will be found on the course Canvas page. Lecture materials, under each of the respective modules, will be posted prior to class and any notes added to the lecture materials will be posted within 24 hours after class.

If I forget, at any point, to post the lecture slides or notes, please do not hesitate to send me an email (cthorp@wpi.edu) to remind me. I do occasionally forget ☺

Class Attendance and Echo360 Class Recordings

If you are unable to attend a class or would like to review a particular class for studying, there will be recordings available via Echo360.

Unless an approved accommodation applies, it is ***expected*** you will attend class and not attempt to utilize the Echo360 recordings as your primary source material. While attendance is not mandatory, I encourage all of you to attend class to participate in discussions and hands-on activities designed to facilitate your learning.

Tips for Success

To be successful in this course, I encourage you do to the following:

- **Attend class regularly**. In addition to the lectures, there will be regular in-class discussions and hands-on activities designed to help facilitate your learning.

- ◊ **Ask questions**. This can be done during class, office hours, or via email. If there is a topic or problem in an assignment you need additional guidance understanding, please let me know.
- ◊ **Engage and participate (in the way in which you feel most comfortable)**. While it may not seem like it, I'm an introvert by nature but I have a passion for education and want to help you learn a solid foundation in statistics. I am not the type of professor who calls out their students, as demonstrated in *Legally Blonde*, but I would also appreciate not being the one talking the whole class.
- ◊ **Be open-minded**. My approach to teaching and grading is entirely about ensuring you learn the material to the best of your abilities. If it's not the typical approach you have seen by other professors, I encourage you to give it a chance, but if there is ever a point in the course when it is not working for you, please let me know!

Statement of Respect

As your professor, I expect you to treat your peers with respect and engage in considerate communication. Everybody comes to the table with different strengths, and weaknesses, so I encourage you to focus not only on your own strengths but also those of your peers.

To ensure you feel respected and part of a safe and inclusive learning environment, please do not hesitate to reach out to me if any of the following are relevant to you:

- ◊ If you have a name and/or pronouns that differ from those in your official WPI records.
- ◊ If something was said in class (by anybody) that made you feel uncomfortable and/or you feel like your performance is being negatively impacted by experiences outside of the course.

Generative AI Statement

Using AI to generate answers to your assignments/project, reflections, or exam revisions undermines your ability to develop critical thinking skills that are essential for this course and your academic success. That being said, understanding how and when to use generative AI tools (such as ChatGPT) is quickly emerging as an important skill. To that end, you are welcome to use generative AI tools in this class **if** it aligns with the learning outcomes or goals associated with assignments.

However, you are fully responsible for the information you submit based on a generative AI query (such that it does not violate academic honesty standards). Your use of generative AI tools must be

properly documented and cited for any work submitted in this course. It is assumed the work you submit was generated by you, either working individually or in groups.

Please feel free to reach out to me with any questions you may have about the use of generative AI tools before submitting any content that has been substantially informed by these tools.

Academic Honesty

You are expected to be familiar with WPI's Academic Honesty policies.

All acts of fabrication, plagiarism, cheating, and facilitation can be prosecuted according to the WPI's policies. If you are ever unsure as to whether your intended actions are considered academically honest, please contact me directly.

Student Resources

Mental Health & Physical Wellbeing

Your mental health and physical wellbeing are of utmost importance. If you are struggling with your health or wellbeing, please reach out to the Wellness Center or Student Development & Counseling Center (SDCC). Resources can be found here.

Accommodations

If you need accommodations or support throughout this course, you are encouraged to contact the Office of Accessibility Services (OAS) as soon as possible to ensure that such accommodations are implemented in a timely fashion. The OAS is in Unity Hall and can be reached via phone (508-831-4908) and/or email (accessibilityservices@wpi.edu).

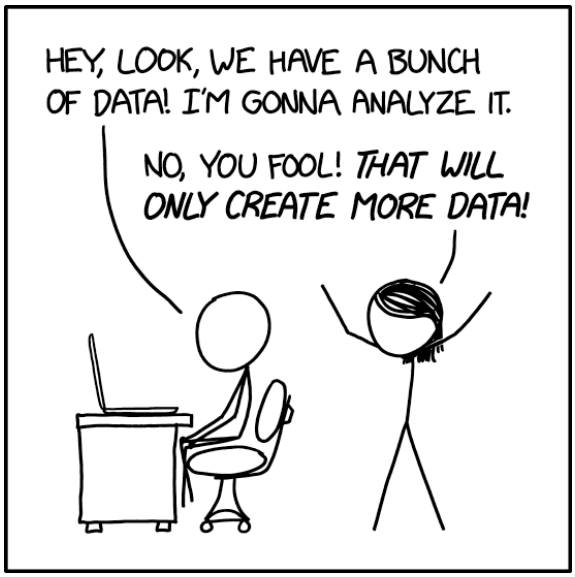
Math Tutoring Center (MTC)

In-person math tutoring will be offered in Stratton Hall 206. Please use wpi.edu/+mtc to sign up for individual tutoring appointments and check MTC hours of operation.

Academic Resources Center (ARC) Tutoring

Peer tutoring and Math and Science Help (MASH) will be offered in-person by the Academic Resources Center (ARC) tutors in A Term. If you are looking for a tutor, please reach out to the

Academic Resources Center (arc@wpi.edu) or submit your availability at Bit.ly/ARCTutor to request additional tutoring. No appointments are needed for MASH group sessions.



https://xkcd.com/2582/