

MTH 461 Syllabus

Fall 2022 - University of Portland

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About the Class

Course Title

MTH 461: Probability & Statistics I

Description

Probability and Statistics is fundamental in many scientific disciplines. In this course, a student will learn the concepts in probability, discrete and continuous random variables, expectation, important probability distributions, sampling, and estimation. This is a calculus-based probability and statistics course where we find analytical solutions to problems, as well as simulation-based reasoning using R. Students who complete this course will have a calculus-based knowledge of probability theory and statistics and be able to confidently apply these ideas to data.

Instructor Information

- **Instructor:** [Alex John Quijano](#)
- **Office:** Buckley Center 279
- **Email:** quijano@up.edu

Class Time and Location

- **Lectures:** TuTh 2:30 PM – 3:55 PM
- **Rooms:** Franz Hall 128

Office Hours

- Alex John Quijano
 - **Walk-in** (Buckley Center 279)
 - * MWF, 1:00 PM - 2:00 PM
 - * TuTh, 4:00 PM - 5:00 PM
 - **One-to-One** (Buckley Center 279 or in Teams)
 - * MWF, 2:00 PM - 5:00 PM ([sign-up for a 30-minute session](#))

Lectures

Lectures will occur synchronously during their scheduled time. The first 30 minutes of class will be a lecture/presentation followed by an activity with a mini-assignment to be submitted by end-of-class or end-of-day (See Class Materials and Resources below for more details).

Prerequisites

MTH 202 and MTH 311.

Learning Objectives

Upon completing MTH 461, students should be able to:

- Articulate the fundamental ideas of probability theory, such as the sample space, events, independence, and conditional probability.
- Articulate the concepts of discrete and continuous random variables, probability functions, mean/expectation, variance, covariance, and correlation.
- To analytically compute the mean/expectation, variance, and the probability of specific events for a given random variable, and derive its probability mass/density function.
- Articulate the Law of Large Numbers and determine the error in estimating the mean and variance of a model from data.
- Estimate parameters from data for a probability function using maximum likelihood estimation.
- Create and execute basic R programs for data wrangling, analysis, and visualization.

Learning Outcomes

Upon completing MTH 461, students should understand

- The fundamental concepts in probability theory.
- The foundations of discrete and continuous random variables and probability functions.
- The basic applications of random variables and probability functions.
- The Law of Large Numbers.
- The method of Maximum Likelihood Estimation.
- The basics of data wrangling, analysis, and visualization using R.

Academic Support

Collaboration Policy

I expect you to participate in the class through lectures, discussion, labs, and other engagements. I also expect you to make use of opportunities to get help outside of class (office hours, Teams, email, tutoring) if you need help. Concise and specific messages are the most helpful so I know how I can best help you.

Students are encouraged to participate in discussions with their peers (or each other) regarding mini-assignments, modules, and mini-projects. However, each student must take responsibility and ownership of their work and submit their work individually.

Office Hours Guidelines

It is strongly recommended that you attend the walk-in office hours or set up a one-to-one meeting with the me if you feel like you are falling behind during our in-person class activities, or if you just need to clarify concepts discussed in class. In order to be more productive during a one-to-one meeting (or the walk-in office hours), these are three recommendations before you come in:

- List all gaps in knowledge you have (missed concepts) or list all concepts that were unclear to you during class. We will address them one by one.
- Prepare questions you want answered and be ready to show relevant materials.

- Regarding assignments, prepare to show (a) what are the steps you have tried and (b) what are the errors you encountered and the strategies you have tried.

Note that these are recommendations so that you can get the most out of the Office hours allocated for you. If you just want to come in and chat about something else, feel free to do so. If the dedicated time for one-to-one meeting does not work for you, send me a message to set up an appointment.

The Learning Commons

Students can get academic assistance through Learning Commons tutoring services and workshops. The Co-Pilot peer tutoring program provides students with opportunities to work with other students to get help in writing, math, group projects, and other courses. Schedule an appointment to meet with a Co-Pilot (tutor) by visiting the Learning Commons website www.up.edu/learningcommons. Students can also meet with a Co-Pilot during drop-in hours. Check the Learning Commons website or drop by the Learning Commons in BC 163 Monday – Friday from 9:00 a.m. – 5:00 p.m. to learn more about their services. Find a tutor at the Learning Commons to get support on your academic journey.

Accessibility Statement

The University of Portland endeavors to make its courses and services fully accessible to all students. Students are encouraged to discuss with their instructors what might be most helpful in enabling them to meet the learning goals of the course. Students who experience a disability are also encouraged to use the services of the Office for Accessible Education Services (AES), located in the Shepard Academic Resource Center (503-943-8985). If you have an AES Accommodation Plan, you should make an appointment to meet with your faculty member to discuss how to implement your plan in this class. Requests for alternate location for exams and/or extended exam time should, where possible, be made two weeks in advance of an exam, and must be made at least one week in advance of an exam. Also, if applicable, you should meet with your faculty member to discuss emergency medical information or how best to ensure your safe evacuation from the building in case of fire or other emergency.

Class Materials and Resources

Class Website

The syllabus, tentative topics schedule, lecture slides, assignments, mini-project information, and all other class materials are posted on this [course website](#).

Assignments

The course is structured with Mini-Assignments due each class time at end-of-class or end-of-day (27 mini-assignments in total), and Module assignments due every three weeks (5 Modules in total). There are 2 mini-projects where we apply concepts and tools learned in class to understand real world data sets. All assignment materials are - or will be - shown in the [Topics Schedule](#). All assignments and mini-project reports are submitted through [Teams Assignments](#).

Modules and the mini-projects are the main sources of evaluation. The mini-assignments are low-stakes sources of evaluation. There will be no exams. The class can move really fast and it is important that you keep up with the assignments, and take feedback seriously.

Textbook

The main textbook is [Probability, Statistics, and Data: A fresh approach using R](#) by Darrin Speegle and Bryan Clair. The textbook is free and open-source. We will also use other supplementary books and resources throughout the course (please see the [Topics Schedule](#)).

Computing

This class will use the R programming language and the R Studio Integrated Development Environment (IDE). There are several ways to use R and R Studio. Below are two ways to access R and R Studio.

- *Clark Library Digital labs.* On campus, there are two computer labs that are located in Shiley Hall room 208 and the Clark Library. When you log-in into the lab computers using your UP credentials, you will have access to R (The availability of R Studio is still unknown; pending confirmation).
- *Downloading and Installing on your own computer.* First, you need to install R; [r-project.org](https://www.r-project.org). Next, you can install R Studio; [rstudio download](https://rstudio.com).

If you need a computer, you can borrow computers - please see the [Clark Library Laptop Borrowing](#) webpage. For more information and resources, visit the [Clark Library Student Services](#).

Microsoft Teams

We will be using Teams [MTH-461A-fa22](#) as the main real-time communication tool for general announcements, assignment submissions, question-answering discussions, and direct messages. Please signup for the course Teams using your UP credentials along with this Teams code: **rg9ngv0**.

Please check the class Teams regularly. If you need to have Teams notifications sent to your email, please set up your email preferences within Teams.

If you prefer communicating through email, note that I had has set up an email filter for this course and you must put the “MTH 461” keyword in your subject line. It is easy for me to get notice of your email if you put the keyword in the subject line. Concise and specific messages are helpful so I know how I can best help you.

Class Assessment

Assessment Disclosure Statement

Student work products for this course may be used by the University for educational quality assurance purposes.

Attendance and Participation

It is strongly recommended that you attend all classes and arrive promptly. Participation is an important part of learning. Be prepared to participate in the discussion by doing the assigned readings every week and submitting mini-assignments during class.

Grading

Each assignment will be graded according to the general grading guide detailed below. Note that each assignment has its own rubric guided by these general guidelines and the assignment’s learning objectives.

Grading guide for conceptual or mathematical questions:

- 5 – Outstanding; showed full understanding of the material. Congratulations!
- 4 – Excellent; showed almost full understanding but with minor errors. Well done!
- 3 – Acceptable; showed some understanding but okay despite a few errors. Good!
- 2 – Needs Improvement; showed some potential but it needs more work. Okay!
- 1 – Needs Major Improvement; at least you tried, E for effort!
- 0 – Incorrect or no submission; meh.

Grading guide for multiple choice questions:

- 1 – Correct.

- 0 – Incorrect.

Final Grades

The computation of a student's final grade is based on the following:

- Mini-Assignments: 20% (each mini-assignment contributes 0.74%)
- Modules: 60% (each module contributes 12%)
- Mini-Projects: 20% (each mini-project contributes 10.00%)
- Total: 100%

Extra Credit

Throughout the course, there will be opportunities for extra credit. You can submit at most two extra credit assignments at the last day of class. The extra credit assignment grade is added to your module assignment grades. Extra credit can be from any of these two categories:

- *A critique on the statistical method, visualization, and/or analysis from a chosen article or news source*, which involves writing a critical essay (2-3 pages and single-spaced) regarding the probability or statistical analysis of a chosen scientific article or news source. The essay must include a summary of the article, a description of the data used, and statistical method used, and a description of a better statistical method, a better way to visualize the results, or a comment on statistical errors/pitfalls if it exists.
- *Create an informative and visually appealing visualization of complex data*, which involves creating a visualization of a chosen data set. You can use tools (R, Python, etc.) to create the visualization. The resulting visualization must include a half-page description of how to read/interpret it and what are its weaknesses.

Late Assignments and Incompletes

You are expected to turn in all completed assignments on time. Circumstances that may disallow you to turn in your work on time – such as a medical reason – are understandable. Please let the instructor know if you are unable to submit your work and have missed the deadline way beyond its original posted date. Because every assignment is an important aspect of your learning in this class, we will discuss when you will turn in the assignment as well as decide upon an acceptable consequence for your turning it in late. I am committed to successfully helping you learn from this course.

Class Expectations

Classroom Norms

- Give your undivided attention to the class discussions.
- If you don't agree with what someone else has to say, you are encouraged to express your point of view, but do so respectfully, and support your claims with textual evidence.
- Everyone has the right to be heard. Maintain confidentiality if a person decides to share a personal experience.
- No name calling and respect each person's identity.
- One person speaks at a time. Give chances for other people to speak.
- Maintain the highest standards of excellence for both you and others.
- Possess the humility to understand that you are not an expert in everything and that everyone has room for improvement.
- Realize that each person will start with a distinct set of skills.

- Be cautious when telling jokes.
- Take care of yourself. If you need to step out of the classroom to have a moment to yourself - or go the bathroom - feel free to do so.

Non-Violence Statement

The University of Portland is committed to fostering a community free from all forms of violence in which all members feel safe and respected. Violence of any kind, and in particular acts of power-based personal violence, are inconsistent with our mission. Together, we take a stand against violence. Join us in learning more about campus and community resources, UP's prevention strategy, and reporting options on the Green Dot website, www.up.edu/greendot or the Title IX website, www.up.edu/titleix.

Academic Honor Principle

Academic integrity is openness and honesty in all scholarly endeavors. The University of Portland is a scholarly community dedicated to the discovery, investigation, and dissemination of truth, and to the development of the whole person. Membership in this community is a privilege, requiring each person to practice academic integrity at its highest level, while expecting and promoting the same in others. Breaches of academic integrity will not be tolerated and will be addressed by the community with all due gravity.

In your written work, follow the conventions of an appropriate citation using the APA, MLA, CSE, or SIAM styles. Please consult with the instructor - or [Clark Library Research Guides](#) if you have questions about proper citations.

Inclusion and Diversity

The natural and mathematical sciences are often viewed as objective disciplines. Science is a method for us to understand how the world works. However, it is historically built from a small set of privileged populations that often ignores the biases. I acknowledge that there may be some parts in this course that have overt and covert biases. Science is a human endeavor, and the pursuit of knowledge and skill must incorporate a diverse set of experiences.

I value all students regardless of their background, country of origin, race, religion, ethnicity, sexual orientation, disability status, etc. I am committed to providing a climate of excellence and inclusiveness within all aspects of this course. If you have any concerns, issues, or challenges, you are encouraged to discuss with the instructor (set up a meeting by email or a direct message in Teams) with the assurance of full confidentiality except for academic integrity code violations or sexual harassment (which I am obligated by law to report).

Mental Health Statement

As a college student, you may sometimes experience problems with your mental health that interfere with academic experiences and negatively impact daily life. If you or someone you know experiences mental health challenges at UP, please contact the University of Portland Health and Counseling Center in Orrico Hall (down the hill from Franz Hall and near Mehling Hall) at 503-943-7134 or hcc@up.edu. Their services are free and confidential, and if necessary they can provide same day appointments. In addition, phone counseling is available by calling 503-943-7134 and pressing 3. The University of Portland Campus Safety Department (503-943-4444) also has personnel trained to respond sensitively to mental health emergencies at all hours. Remember that getting help is a smart and courageous thing to do – for yourself, for those you care about, and for those who care about you.

COVID-19 Related Statements

Generally, students are expected to attend all class sessions according to the instructor's direction. Students who feel unwell or have a temperature above 100 degrees should NOT attend class in person. These students should inform their instructor as soon as possible.

Students who must be in isolation due to COVID-19 symptoms or a positive test should also contact their instructor as soon as possible to work out details for keeping up with the course material while in isolation.

Should the instructor test positive for COVID-19, even without symptoms, the course will be temporarily conducted remotely. Should the instructor be unable to teach for an extended period of time, the respective department or unit will find a substitute to continue the course.

Following current guidance from our county and state health authorities, face coverings are highly recommended in the classroom and all indoor spaces. As we move through the semester, however, classroom rules and procedures may change. All students and instructors must follow any University-wide COVID-19 rules and procedures that might be in put place at any given time during the semester for classrooms, labs, and all common areas of academic buildings. Such rules and procedures may include required face coverings, suggested distancing protocols and directions, and limitations on eating and drinking in the classroom, among other things. Failure to follow any of the COVID-19 classroom rules in place at the time could result in a student's removal from the course and/or a report filed with the Office of Student Conduct.

Ethics of Information

The University of Portland is a community dedicated to the investigation and discovery of processes for thinking ethically and encouraging the development of ethical reasoning in the formation of the whole person. Using information ethically, as an element in open and honest scholarly endeavors, involves moral reasoning to determine the right way to access, create, distribute, and employ information including: considerations of intellectual property rights, fair use, information bias, censorship, and privacy. More information can be found in the Clark Library's guide to the Ethical Use of Information at libguides.up.edu/ethicaluse.