Course Description

Building upon the introductory material presented in MATH 156 (or equivalent), this is a second course in statistical methods and data analysis. The course objectives are:

- To study in detail the distinctions between observational studies and controlled experiments, the questions they can address and what types of statistical methods are appropriate for analyzing them.
- To learn common statistical tools used to analyze data, such as: 2 sample $t$ -tests, analysis of categorical data and Goodness-of-Fit tests, multiple comparison procedures, multiple regression, analysis of variance (ANOVA). Time permitting, we will also discuss nonparametric methods (such as the randomization test and the rank-sum test), and log transformations.
- To get hands-on experience performing data analysis using the statistical software package R.
- To interpret the results of a statistical analysis correctly and effectively communicate the results to others.

With respect to the core curriculum at Xavier, this course provides the opportunity for the student to: (1) develop effective written and oral communication skills, and (2) develop his/her critical thinking ability.

Prerequisite

MATH 156 (or equivalent) or MATH 116 with a final grade of B- or higher.

Required Text


Technology

- The classroom workstations have the statistical software package R pre-installed. “*R is a
free software environment for statistical computing and graphics. It compiles and runs on a wide variety of UNIX platforms, Windows and MacOS.” To download a free copy, go to: www.r-project.org. If you have a personal computer or laptop, it is strongly recommended that you install R, a statistical package that will be used throughout the semester. Also, a window-paned interface to R, known as Rstudio, is recommended. You can find the link here: www.rstudio.com/ide

- Although not required, you should have access to a TI–83/83+ or a TI–84 graphing calculator.
- **NOTE**: Video and audio recordings of lectures and posting of MATH 171 course materials are strictly prohibited without instructor approval.

## Course Structure & Grading

- Course materials and calendar can be found at the MATH 158 website: http://canvas.xavier.edu.

  - 15.0%  Homework, Lab, and In-Class Exercises
  - 15.0%  Project #1
  - 15.0%  Project #2
  - 17.5%  Exam #1
  - 17.5%  Exam #2
  - 20.0%  Final Exam (cumulative)

  - **Homework, Lab and In-Class Exercises**: An essential key to success in MATH 158 is to keep up with the pace of the course. Homework, typically consisting of reading and exercises, and Lab Exercises will be assigned on a regular basis.

  - **Projects**: Specific details will be provided later in the semester. Project assignments are designed to meet the course objectives previously stated, and demonstrate the applicability of statistical methods to other disciplines. In particular, students will have the opportunity to review articles published in academic journals and conduct their own data analysis.

  - **Exams**: Two in-class exams are scheduled for the semester. In addition, a cumulative final exam will be given. **The final exam is scheduled for Thursday, May 8 at 8:30am.**

- Overall course grades will be determined by the following scale:

  \[
  A \equiv [93,100] \quad A- \equiv [90,93] \\
  B+ \equiv [87,90] \quad B \equiv [83,87] \quad B- \equiv [80,83] \\
  C+ \equiv [77,80] \quad C \equiv [73,77] \quad C- \equiv [70,73] \\
  D+ \equiv [67,70] \quad D \equiv [63,67] \quad D- \equiv [60,63] \\
  F \equiv [0,63]
  \]
Although not guaranteed, it is possible that some type of curve will be applied. The curve will reward diligent students (e.g., those who attend lectures regularly, seek help during office hours, etc.) and/or students who have shown marked improvement over the semester; they will be more positively affected by the curve. In addition, the instructor reserves the right to significantly reduce the final grade depending on the number of unexcused absences accumulated by the student during the semester.

**Academic Integrity**

- In accordance with the policies described in the Xavier University Catalog, students are expected to follow the following course policies.

  - **Classroom/Attendance Policy**: Students are expected to attend all scheduled lectures. Please practice good classroom etiquette: come to class on time, turn off cell phones, refrain from disruptive behavior, and be respectful of your fellow classmates.

  - **Honor Statement**: Students will be required to sign the following MATH 158 Honor pledge on certain assignments:

    "As a student at Xavier University, I have neither given nor received unauthorized aid on this assignment/exam."

    "(Student signature)"

  - What constitutes “unauthorized” and “authorized” aid will be detailed in each assignment or exam. In general, students are encouraged to work together and discuss homework exercises. However, the solution write-up must be done individually, and should not be copied from someone else. IMPORTANT: Copying solutions from any other person or source without disclosure, will be treated as cheating. Any outside sources (e.g., study group members, other textbooks, internet sites) should be cited and referenced. During exams, absolutely no collaboration with other persons is permitted.

**Some Friendly Advice**

- Try to see the big picture! Realize that each statistical test has a particular purpose. Know what assumptions are required to use the test. Know how to interpret computer output. Know what to do after conducting a test.

- Invest about 30 minutes after every class to review your lecture notes. Do your assignments while the relevant ideas are still fresh in your mind, and keep pace with the course material. Highlight or make additional notes in the margin where you feel important terms or concepts were described. To help you do this, ask yourself the following:

  1. What was the most important point in the lecture?
  2. What was the muddiest point?
  3. What would you like to hear more about?

These questions comprise the “Muddiest Point in the Lecture” feedback device,
which was introduced by Harvard statistician Frederick Mosteller.

- Write down any questions about anything that you aren’t quite clear on. As far as the ideas you are comfortable with: how do they relate to your question?

- Bring your questions to lecture, or to the instructor’s office hour. (If you cannot make the scheduled office hours, contact the instructor to set-up a meeting time, or check the availability of the Math Tutoring Lab, located in Conaton Learning Commons Room 419.) If you have a study group, use your questions to stimulate discussion.

- An ideal solution to a MATH 158 problem should not only include all the mathematical steps needed to arrive at the final solution, but also a few sentences which summarize the main ideas used in your answer. If you can explain a solution in words, then you probably have a good understanding of both the problem and solution.

- Try not to be overly concerned with you grades, and only try to “get by”. If you really understand ideas and concepts, then I will do my best to ensure that your performance on class assignments reflects that. (If you try to just memorize everything, you will undoubtedly feel overwhelmed by the number of symbols and amount of material!)

• Disclaimer •

Please be aware that although this syllabus provides a general guideline/description of Max Buot’s MATH 158 course, it is still subject to change. Official changes concerning the items contained in this document will be announced in class or posted on the course website.