THE OHIO STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

SYLLABUS: STAT 6910
APPLIED STATISTICS I
AUTUMN 2022

Course overview

Instructor

Peter F. Craigmile
Office: 427 Cockins Hall
Email address: pfc@stat.osu.edu
Class website: https://osu.instructure.com/courses/129719
Lectures: Hayes Hall 005, Tuesday and Thursdays, 9.25–11.15 am. Lectures are not recorded.
Office hours: Office hours in 427 Cockins Hall:
Tuesdays 2–3pm, Thursdays noon–1pm, or by appointment

GTA

Hyoin An
Email address: an.355@buckeyemail.osu.edu
Office hour: Mondays 2-3pm in 420 Cockins Hall.

Course description

Statistics 6910 is a course on applied statistics. It will quickly cover material on descriptive statistics and on the basic techniques of inference (hypothesis tests and confidence intervals), including techniques appropriate for samples from normal distributions, techniques based on randomization theory, and techniques for simple, tabular data. Following the introductory material, we will move on to experimental design. We will cover the basic principles of design and the techniques used to analyze experiments that follow standard experimental designs. Specific designs to be covered include one-way analysis of variance (ANOVA), two-and-higher-way ANOVA, factorial designs, mixed effect models, and block designs.

Prerequisites: Statistics 6801 (may be taken concurrently), or permission of instructor.

Course learning outcomes

Upon successful completion of the course, students will be able to:

1. Grasp the basics of descriptive and inferential statistics from an applied perspective;
2. Appreciate the importance of the assumptions that the models are based on;
3. Make sound decisions for an analysis;
4. Understand and use appropriate statistical notation and terminology;
5. Implement formal techniques flawlessly;
6. Summarize an analysis appropriately.

Course materials

Required

A. M. Dean, D. Voss, and D. Draguljic (2017), Design and Analysis of Experiments, 2nd Edition, Springer, NY.

You can download the eBook from
https://link-springer-com.proxy.lib.ohio-state.edu/book/10.1007%2F978-3-319-52250-0

Errata and datasets available from http://www.wright.edu/~dan.voss/DeanVossDraguljic.html

I will highlight other useful references as the course progresses.

Course technology

For help with your password, university e-mail, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at https://ocio.osu.edu/help/hours, and support for urgent issues is available 24x7.

- **Self-Service and Chat support:** http://ocio.osu.edu/selfservice
- **Phone:** 614-688-HELP (4357)
- **Email:** 8help@osu.edu
- **TDD:** 614-688-8743

Baseline technical skills necessary

- Basic computer and web-browsing skills
- Navigating Carmen

Technology skills necessary for this specific course

- CarmenZoom (for some lectures)

Necessary equipment

- Computer: current Mac (OS X) or PC (Windows 10+) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed
- Microphone: built-in laptop or tablet mic or external microphone

Necessary software

- This class requires you to use the statistical software package called R (The R Project for Statistical Computing; http://www.r-project.org/). This software package is available as Free Software.
    - You can download R for Windows, Mac, and Linux, from the CRAN archive at https://cran.r-project.org.
    - An in-depth introduction to R is available at http://cran.r-project.org/doc/manuals/R-intro.pdf
    - Hands-on tutorials are available in the Swirl system, which you can learn about at http://swirlstats.com/. In particular, "R Programming: The basics of programming in R" is an appropriate first tutorial for students who have never used R.
- An easier to use interface to R is available in the software package RStudio. This package is available for Windows, Mac, and Linux and can be downloaded for free from http://rstudio.org. **Note that RStudio requires R to be installed.**
- More details will be given in lectures.

Grading and faculty response

Homework and exams

Assignment or category	Percentage
Homework	**15**
Midterm 1	**25**
Midterm 2	**25**
Take-home final exam	**35**
Total	**100**

Grades will be recorded on the class website.

Homework will be due at the beginning of class on the day it is due (9.25am). Typically, no late homework will be accepted. You are encouraged to work together on the homework, but do not copy any part of a homework. Each student must produce his/her own homework to be handed in. All homework must be submitted online as a PDF file through the class website. Feel free to ask me or the GTA for help after you have attempted the questions. The GTA for the course does not have the time to provide detailed explanations on each question that is graded. To make up for this, I will endeavor to

create homework solutions that are detailed enough to allow you to understand how the question could be approached.

Homework preparation rules: Put your name on your homework assignment. Submit the problems in order, clearly numbered, making sure that the computer output and discussion is placed together (do not put computer output at the end of homework). Raw computer output is not acceptable. Make it clear what parts of the output are relevant and show how they answer the questions posed in the homework.

Exams: There will be two midterms and one final exam:

Midterm 1	Tue Oct 4	in class
Midterm 2	Tue Nov 8	in class
Final	Fri Dec 9	8.00 am–9.45 am

All exams will be **closed book/closed notes**. A basic calculator is allowed – tablets, laptops, cellphones, and communication devices are not. There are no make-up exams. Further details will be given in advance of each exam.

The first midterm covers the material up to and including Thu Sep 29.
The second midterm covers the material up to and including Thu Nov 3.
The final will cover all the material for the course.

Faculty feedback and response time

I am providing the following list to give you an idea of my intended availability throughout the course. (Remember that you can call **614-688-HELP** at any time if you have a technical problem.)

Grading and feedback

For large weekly assignments, you can generally expect feedback within **10 days**.

E-mail

I will reply to e-mails within **24 hours on school days**.

Attendance, participation, and discussions

Students may miss class, for a variety of reasons related to COVID-19. Please stay in contact with the instructor so that we can discuss accommodations should they be needed.

Student participation requirements

The following is a summary of everyone's expected participation:

- **In lectures:**
  Students will be expected to participate, discuss, and answer questions in lectures.
- **Logging in**: **AT LEAST THREE TIMES PER WEEK**
  Be sure you are logging in to the course in Carmen each week, including weeks with holidays.

- **Office hours**: **OPTIONAL OR FLEXIBLE**
  All office hours, are optional. If you are required to discuss an assignment with me, please contact me at the beginning of the week if you need a time outside my scheduled office hours.

Discussion and communication guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style**: While there is no need to participate in class discussions as if you were writing a research paper, you should remember to write using correct grammar, spelling, and punctuation. Informality (including an occasional emoticon) is fine for non-academic topics.
- **Tone and civility**: Let us maintain a supportive learning community where everyone feels safe and where people can disagree amicably.
- **Citing your sources**: When we have academic discussions, please cite your sources to back up what you say. (For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.)
- **Backing up your work**: Consider composing your academic posts in a text editor or word processor, where you can save your work, and then copying into the Carmen discussion.

Other course policies

Health and safety

The Ohio State University Wexner Medical Center's Coronavirus Outbreak site (https://wexnermedical.osu.edu/features/coronavirus) includes the latest information about COVID-19 as well as guidance for students, faculty and staff. Guidelines and requirements for campus safety from the University's COVID-19 Transition Task Force were published on the Safe and Healthy website (https://safeandhealthy.osu.edu).

Student support services

Student support services offered on the OSU main campus http://ssc.osu.edu.

Academic integrity policy

Policies for this course

- **Exams**: You must complete the midterm and final exams yourself, without any external help or communication.
- **Written assignments**: Your written assignments, including discussion posts, should be your own original work.
- **Reusing past work**: In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past

research or revisit a topic you have explored in previous courses, please discuss the situation with me.

- **Falsifying research or results**: All research you will conduct in this course is intended to be a learning experience; you should never feel tempted to make your results or your library research look more successful than it was.
- **Collaboration and informal peer-review**: The course will include opportunities for formal collaboration with your classmates. While study groups are encouraged, remember that comparing answers on a quiz or assignment is not permitted. If you're unsure about a particular situation, please feel free just to ask ahead of time.

Ohio State's academic integrity policy

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentlife.osu.edu/csc/.

Copyright disclaimer

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Statement on title IX

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at http://titleix.osu.edu or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu

Accessibility accommodations for students with disabilities

The university strives to make all learning experiences as accessible as possible. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university's request process, managed by Student Life Disability Services. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; http://slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Accessibility of course technology

This course requires use of Carmen (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.

- Carmen (Canvas) accessibility
- Streaming audio and video
- Synchronous course tools

Your mental health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614- 292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on-call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273- TALK or at suicidepreventionlifeline.org

Disclaimer

This syllabus should be taken as a reliable guide for the course content. However, you cannot claim any rights from it and I reserve the right to change due dates or the methods of grading and/or assessment if necessary. Any changes will be communicated to you through official course announcements.

Course schedule (tentative)

Week	Dates	Topics
1	Aug 23 Aug 25	One and two-sample problems
2	Aug 30 Sep 1	One and two-sample problems Contingency tables and goodness of fit
3	Sep 6 Sep 8	Contingency tables and goodness of fit Principles of designing experiments
4	Sep 13 Sep 15	One-way analysis of variance (ANOVA)
5	Sep 20 Sep 22	One-way ANOVA
6	Sep 27 Sep 29	One-way ANOVA
7	Oct 4 Oct 6	**Midterm 1 (Tue Oct 4)** Two-way ANOVA
8	Oct 11 ~~Oct 13~~	Two-way ANOVA **October break – no classes (Oct 13–14)**
9	Oct 18 Oct 20	Two-way ANOVA
10	Oct 25 Oct 27	Higher order ANOVA Block designs
11	Nov 1 Nov 3	Block designs
12	Nov 8 Nov 10	**Midterm 2 (Tue Nov 8)** Block designs
13	Nov 15 Nov 17	Confounded and fractional factorial experiments
14	Nov 22 ~~Nov 24~~	Confounded and fractional factorial experiments **Thanksgiving – no classes (Nov 23–25)**
15	Nov 29 Dec 1	Random and mixed effects
16	Dec 6 Dec 10	Random and mixed effects (Last day of classes) **Final Exam (Fri Dec 9, 8.00–10.00 am)**