



THE OHIO STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

# **SYLLABUS: STAT 6910**

## **APPLIED STATISTICS I**

### **AUTUMN 2023**

## **Course overview**

### **Instructor**

**Instructor: Sebastian Kurtsek**

Office: Cockins Hall 440B

Email address: [kurtek.1@stat.osu.edu](mailto:kurtek.1@stat.osu.edu)

Phone number: 614-292-0463 (contact via e-mail is highly preferred)

Office hours: Tuesdays, 2–3PM; Thursdays, noon–1pm

Graduate teaching associate: Xinyu Zhang

Email address: [zhang.11591@osu.edu](mailto:zhang.11591@osu.edu)

Office hour: TBD

### **Course description**

STAT 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: STAT 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](mailto: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.

## Course delivery

- This class will take place in person two times per week on Tuesdays and Thursdays, 9:25AM-11:15AM in Baker Systems 148.
- All assignments will be posted on the Carmen class website. You will be given ample time to complete the assignments. Assignment due dates will be announced in class and on the Carmen course webpage.
- I will hold weekly in person office in my office in Cockins Hall 440B.

## Grading and faculty response

### Homework and exams

Assignment or category	Percentage
Homework	15
Midterm 1	25
Midterm 2	25
Final Exam	35
Total	100

Grades will be recorded on the class website.

## Homework

I will assign homework regularly throughout the semester. You may discuss the homework with other students, but **DO NOT** copy any part of someone else's work or solutions from any other sources. Violations of this policy will be treated as academic misconduct. I encourage you to talk to me or the GTA (during office hours) if you have questions after serious attempts have been made to work on an assignment.

**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. All homework assignments will be submitted via the Carmen course webpage.

## Exams

There will be two midterms and one final exam, with tentative dates listed on the schedule at the end of the syllabus and below. Any potential date changes will be communicated well in advance in class and on the Carmen webpage. All exams will be closed book/closed notes. During the exams, you will need to work independently without any form of assistance or communication with anyone. A basic calculator is permitted; however, using a cell phone, tablet, laptop or any other device for this purpose is not permitted.

Midterm 1	Tuesday, October 3	in class
Midterm 2	Tuesday, November 7	in class
Final	Friday, December 8	8AM–9.45AM

The first midterm covers the material up to and including Thursday, September 28.

The second midterm covers the material up to and including Thursday, November 2.

The final covers all material presented in the course.

## Late assignments

Generally, late assignments will not be accepted, and no make-up exams will be provided. However, if there are extenuating circumstances beyond your control, please contact the course instructor immediately.

## 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 homeworks and exams, you can generally expect feedback within **7-14 days**.

## E-mail

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

# Attendance and participation

## Student participation requirements

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

- **In person class meetings: REQUIRED**  
While formal attendance will not be taken during class, all students are required to attend all in person lectures and are responsible for all material presented during these 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. If you have a situation that might cause you to miss an entire week of class, discuss it with me *as soon as possible*.
- **Office hours: OPTIONAL**  
All office hours will be held in person in my office in Cockins Hall 440B. 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.

## Religious accommodations

It is Ohio State's policy to reasonably accommodate the sincerely held religious beliefs and practices of all students. The policy permits a student to be absent for up to three days each academic semester for reasons of faith or religious or spiritual belief.

Students planning to use religious beliefs or practices accommodations for course requirements must inform the instructor in writing no later than 14 days after the course begins. The instructor is then responsible for scheduling an alternative time and date for the course requirement, which may be before or after the original time and date of the course requirement. These alternative accommodations will remain confidential. It is the student's responsibility to ensure that all course assignments are completed.

## 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.
- **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>).

### Potential disruptions to instruction

- As much as is possible, students will have access to material online if they are unable to attend class because of positive diagnosis, symptoms, or quarantine required following contact tracing. However, please note that lectures will not be recorded.
- If the instructor is unable to be present in person because of positive diagnosis, symptoms, or quarantine following contact tracing, the course will temporarily shift to online instruction. Details will be given on the course website if this arises.

### 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.
- **Homework assignments:** You are expected to produce original and independent work for homework assignments. Although students are often encouraged to work together on homework assignments, all students must submit their own written work in their own words. Note that allowing others to copy your work is considered academic misconduct. Academic misconduct will not be tolerated and will be dealt with procedurally in accordance with University Rule 3335-31-02. (This policy can be found at <http://oaa.osu.edu/coam.html>.)
- **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 an 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](mailto: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](mailto: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.

## 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](http://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](http://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 22 Aug 24	One and two-sample problems
2	Aug 29 Aug 31	One and two-sample problems Contingency tables and goodness of fit
3	Sep 5 Sep 7	Contingency tables and goodness of fit Principles of designing experiments
4	Sep 12 Sep 14	One-way analysis of variance (ANOVA)
5	Sep 19 Sep 21	One-way ANOVA
6	Sep 26 Sep 28	One-way ANOVA
7	Oct 3 Oct 5	<b>Midterm 1</b> Two-way ANOVA
8	Oct 10 Oct 12	Two-way ANOVA <b>Autumn Break – no class</b>
9	Oct 17 Oct 19	Two-way ANOVA
10	Oct 24 Oct 26	Higher order ANOVA Block designs
11	Oct 31 Nov 2	Block designs
12	Nov 7 Nov 9	<b>Midterm 2</b> Block designs
13	Nov 14 Nov 16	Confounded and fractional factorial experiments
14	Nov 21 Nov 23	Confounded and fractional factorial experiments <b>Thanksgiving Holiday – no class</b>
15	Nov 28 Nov 30	Random and mixed effects
16	Dec 5 Dec 8	Random and mixed effects (last day of class) <b>Final Exam (Friday, 8AM–9:45AM)</b>