THE OHIO STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

STAT 5302: INTERMEDIATE DATA ANALYSIS II
SPRING 2026

Course overview

Instructor Xinyi Xu

Email address: xinyi@stat.osu.edu

Lectures: MWF 3-3:55pm, Dreese Lab 317

Office hours: Virtual hours via CarmenZoom: Monday 2-3pm

Teaching Assistant Runze Cui

Email address: cui.571@buckeyemail.osu.edu

Role: Grading homework assignments, monitoring the course discussion board and answering questions about homework

Office hours: TBD

Course description

Statistics 5302 is the second course in a two-semester sequence in Intermediate Data Analysis. We assume that students are familiar with organizing and summarizing data, the nature of relationships between variables, sampling distributions and the underlying rationale for hypothesis tests and confidence intervals. We also assume that students are comfortable with a variety of models and inferential procedures. Specifically, the material in 5302 relies heavily on the additive model (see the early part of the text for a description of this model) and one-way ANOVA. The course will cover simple linear regression, multiple linear regression, and ANOVA designs beyond the one-way layout. For each of the common statistical methods covered in the course, we will focus on generation of appropriate models for data, estimation of the model parameters and their inference, and model diagnostics. Applications of the methods will be illustrated with data analysis.

Prerequisites:

STAT 5301 (Intermediate Data Analysis I) or permission of instructor.

Course learning outcomes

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

- Identify an appropriate analysis for data collected in a study
- Carry out such an analysis
- Examine whether the assumptions behind the analysis are reasonable, and
- Recognize the strengths or weaknesses of the study based on how the data were collected.
- Understand how the design of a study affects the conclusions that can be made
- Write and discuss what conclusions can be drawn from statistical analyses

GE education goals and expected learning outcomes

This course satisfies the **General Education foundation requirement in Mathematical and Quantitative Reasoning or Data Analysis** which has the following goals and expected learning outcomes:

Goals: Successful students will be able to apply quantitative or logical reasoning and/or mathematical/ statistical methods to understand and solve problems and will be able to communicate their results.

Expected Learning Outcomes (ELOs): Successful students are able to:

1. Use logical, mathematical and/or statistical concepts and methods to represent real-world situations.
2. Use diverse logical, mathematical and/or statistical approaches, technologies and tools to communicate about data symbolically, visually, numerically and verbally.
3. Draw appropriate inferences from data based on quantitative analysis and/or logical reasoning.
4. Make and evaluate important assumptions in estimation, modeling, logical argumentation and/or data analysis.
5. Evaluate social and ethical implications in mathematical and quantitative reasoning.

This course also satisfies the **Legacy General Education requirement in Data Analysis** which has the following goals and expected learning outcomes:

Goals: Students develop skills in drawing conclusions and critically evaluating results based on data.

Expected Learning Outcomes (ELOs):

1. Students understand basic concepts of statistics and probability.
2. Students comprehend methods needed to analyze and critically evaluate statistical arguments.
3. Students recognize the importance of statistical ideas.

Course materials

Required: *The Statistical Sleuth – A Course in methods of data analysis,* 3rd Edition, by Ramsey and Schafer, Duxbury Press, 2012 (http://www.statisticalsleuth.com)

The textbook for this course is being provided via CarmenBooks. Through CarmenBooks, students obtain publisher materials electronically through Carmen/Canvas. You can access this eBook through the **CarmenBooks** reader link in the course navigation of the Carmen course for this class. For more information on the program or information on how to opt out, please visit the CarmenBooks website.

Course delivery

The course will be **delivered in person** at the scheduled class times. Students are expected to attend all lectures as well as studying the material that is assigned.

Also, the instructor will hold weekly office hours and will post homework assignments on the course website. Please check the course website frequently for important announcements, lecture material, homework assignments and solutions.

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 for online courses

- Basic computer and web-browsing skills
- Navigating Carmen; the following website may help you if you encounter difficulties with Carmen: https://resourcecenter.odee.osu.edu/canvas/ .

Technology skills necessary for this specific course

- CarmenZoom

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

- In this course, you will be required to do some basic statistical analyses on the computer using the statistical software package 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.**

Grading and faculty response

Homework and exams

Assignment or category	Percentage
Homework	30
Midterm	30
Comprehensive Final	40
Total	100

Homework:

Homework will be collected approximately bi-weekly. It will consist of both written problems and computer programming/data analysis problems. **NO late homework will be accepted unless prior exception has been sought.** If you are unable to complete an assignment on time, please get in touch with the instructor as soon as possible so we can discuss your situation.

You are encouraged to work together on the problems, but each student must hand in their own work, written in their own words. Do not copy any part of another student's homework including computer output. Use of homework solutions distributed in previous offerings of the course or available on the web constitutes academic misconduct and will be handled according to university rules. **All homework must be submitted online as a PDF file through the course website**. Please be sure that the questions are clearly labeled, all supporting work (including computer code) can be easily identified, and that all figures/tables are referenced and interpreted in the text.

Exams:

There will be one midterm exam and one comprehensive final exam.
Midterm (tentative): March 9, Monday, 3-3:55pm
Final (Comprehensive): May 1, Friday, 4-5:45pm

- If you cannot be available at these times for unavoidable reasons, you must speak with the course instructor immediately. **If you fail to take an exam during the time when it is available without any communication with us to explain, we will not allow you to make up the exam unless there is an emergency that you can document.**
- Both exams will be **close-book/closed-notes**; however, you will be allowed a calculator and double-sided 8.5"×11" formula sheets (one page for the midterm and two pages for the final). We take academic honesty very seriously in this course. You may communicate with only the instructor if you have any questions during the exam periods.

You have until one week after receiving your grades on the exams to dispute the grade; the same applies to any homework grade. Note that when asking for a question to be re-graded, the entire assignment/exam may be re-graded, and so you run the risk of losing more points than you gain back.

Faculty feedback and response time

We are 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.)

Preferred contact method

- If you have questions about the lectures or notice any typos in the materials, please email the instructor. I will reply to e-mails within **24 hours on school days**.
- **If you have questions about the grading of homework assignments, please email the teaching assistant directly**.

Attendance, participation, and discussions

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

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 good grammar, spelling, and punctuation. Informality (including an occasional emoticon) is fine for non-academic topics.

- **Tone and civility**: Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online.
- **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 word processor, where you can save your work, and then copying into the Carmen discussion.

Academic policies

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 for instructional materials

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.

Accessibility accommodations for students with disabilities

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. 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.

If you are ill and need to miss class, including if you are staying home and away from others while experiencing symptoms of a viral infection or fever, please let me know immediately. In cases where illness interacts with an underlying medical condition, please consult with Student Life Disability Services to request reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or http://slds.osu.edu

Religious accommodations

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the Office of Institutional Equity.

Policy: Religious Holidays, Holy Days and Observances

Disclaimer

This syllabus should be taken as a fairly reliable guide for the course content. However, you cannot claim any rights from it and in particular we 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	Reading
1	1/12-16	Simple linear regression; least squares regression estimation	7.1-7.3
*	1/19	*Martin Luther King Day (no class)*	
2	1/21-23	Inferential tools for simple linear regression models	7.4
3	1/26-30	Model assessment for simple linear regression	8.1-8.3
4	2/2-6	Model assessment for simple linear regression	8.4-8.6
5	2/9-13	Multiple linear regression models	9.1-9.3
6	2/16-20	Multiple linear regression models	9.4-9.5
7	2/23-27	Inferential tools for multiple linear regression models	10.1-10.2
8	3/2-6	F-tests and ANOVA for multiple linear regression	10.3-10.4
*	3/9	**Midterm Exam**	
9	3/11-13	Model assessment for multiple linear regression	11.1-11.2, 11.5
*	3/16-20	*Spring Beak (no class)*	
10	3/23-27	Influential observations; weighted least squares	11.3-11.4, 11.6
11	3/30-4/3	Sequential variable/model selection	12.1-12.3
12	4/6-10	All subsets variable/model selection	12.4–12.7
13	4/13-17	Two-way ANOVA	13.1-13.3
14	4/20-24	Inferential tools for two-way ANOVA	13.4-13.5
*	4/27	Final Review	
*	5/1	**Comprehensive Final Exam**	