



STAT 5301

Intermediate Data Analysis I (20970)

Autumn 2026

Syllabus - Instructor Information

Lang Zeng

Professional Qualifications

- Ph.D. in Biostatistics, University of Pittsburgh
- M.S. in Biostatistics, University of Michigan
- B.Sc. in Mathematics and Applied Mathematics, Peking University
- B.Med. in Preventive Medicine, Peking University

Syllabus - Required or Recommended Readings

- [IPS] Introduction to the Practice of Statistics (5th Edition onwards) by D.S. Moore and G.P. McCabe
- [SS] The Statistical Sleuth: A Course in Methods of Data Analysis by Ramsey F. and Schafer D. (2012), 3rd Edition, Cengage Learning, ISBN-13:978-1-133-49067-8

The textbook for this course is being provided via CarmenBooks. Through CarmenBooks, students obtain publisher materials electronically through CarmenCanvas, saving them up to 80% per title. The fee for this material is included as part of tuition and is listed as CarmenBooks eText Library on your Statement of Account. In addition to cost-savings, materials provided through CarmenBooks are available immediately on or before the first day of class. There

is no need to wait for financial aid or scholarship money to purchase your textbook.

Unless you choose to opt-out of the program, you do NOT need to purchase any materials for this course at the bookstore. For more information on the program or information on how to opt out, please visit the Teaching & Learning Resource Center. If you do opt out, you are still responsible for all readings/activities related to the materials and will need to purchase a copy independently.

If you encounter any technical issues, please see the CarmenBooks Troubleshoot Tips page.

Syllabus - Course Schedule

Week	Topic
1–2	Exploratory Data Analysis & Data Collection — graphical and numerical summaries, R basics, simple linear regression, sampling, and experimental design
3–4	Probability Foundations — conditional probability, random variables, expectation and variance, sampling distributions, and the Central Limit Theorem
5	Midterm 1 & Confidence intervals and interpretation
6–8	One- and Two-Sample Inference — Z and t tests, multiple testing, Bonferroni correction, two-sample comparisons, unequal variances, assumptions, robustness, and transformations

Week	Topic
9–10	Inference for Proportions & Nonparametric Methods — proportion tests and confidence intervals, power, sign/signed-rank tests, Wilcoxon rank-sum tests, permutation tests, and chi-square tests
11–12	Midterm 2 & Introduction to ANOVA
13–14	Multiple Comparisons & Data Analysis Project — Bonferroni, Tukey-Kramer, contrasts, Scheffé methods, project work, presentation, and report
15–16	Two-Way ANOVA & General Model Comparisons — interaction effects, comparison of ANOVA methods, and special topics
17	Final Exam

[Course Schedule](#) (Click Here For Details)

Course Details - Instructor Contact Details

Email: zeng.707@osu.edu

Office: Cockins Hall 327

Course Details - Office Hours

Tuesday 10am – noon (right after class), or by appointment, in my office Cockins Hall 327. I may remain in the classroom for a short period of time after class to answer questions.

Course Details - Additional Instructional Staff

Grader: Skylar Shi (shi.2154@osu.edu)

Tutoring by appointment.

Course Details - Class Meeting Details

Class Meeting Details: 08:00 AM-09:50 AM - Scott Lab N054 - TR

Course Details - Course Description

The first course in a two-semester non-calculus sequence in data analysis covering descriptive statistics, design of experiments, probability, statistical inference, one-sample t, goodness of fit, two sample problem, and one-way ANOVA. Prereq: Math 1075 or equiv, or Math Placement Level of R, or permission of instructor. Not open to students with credit for 5302.

Course Details - More About This Course

Course Website

Important announcements, course materials, homework problems, and other information about the class are posted on Carmen (carmen.osu.edu, login with your web ID)

R Programming

Throughout this course we will intensively use the R programming language for illustrations and data analysis. We will introduce some basics of R along with the progresses of the course, and R programming may be required for some homework assignments. Exams do not test on R programming.

You can download R for Windows, Mac, and Linux, from the CRAN archive at <https://cran.r-project.org>. An easier-to-use interface to R is available in the

software package [RStudio](#).

It may be helpful to become familiar with the (free) R Markdown authoring framework as you take this class; its use is required in future courses in this sequence. An online guide with overview information can be found at <https://rmarkdown.rstudio.com>.

Technology Support

Microsoft Office 365 ProPlus All Ohio State students are now eligible for free Microsoft Office 365 ProPlus through Microsoft's Student Advantage program. Each student can install Office on five PCs or Macs, five tablets (Windows, iPad® and Android™) and five phones.

Students are able to access Word, Excel, PowerPoint, Outlook and other programs, depending on platform. Users will also receive 1 TB of OneDrive for Business storage. Office 365 is installed within your BuckeyeMail account. Full instructions for downloading and installation can be found <https://ocio.osu.edu/kb04733>.

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

Course Details - Course Learning Outcomes

- **The course objectives address the General Education learning outcomes as follows:**

Students in Statistics 5301 are expected to 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. Doing so requires understanding basic concepts in statistics and probability; the ability to create graphical and numerical summaries of data; understanding how the design of a study affects the conclusions that can be made; and the ability to carry out basic statistical analyses (by hand or using statistical software). Students will conduct analyses of data, including a discussion (in plain English) of what conclusions can be drawn. The goal of statistics is not calculation but gaining understanding from numbers. This means that the correct numerical answer will only receive partial credit. The remainder of the credit will be available for choosing the best method of solution and explaining why the method is appropriate. You will also need to interpret your answers in the light of the practical problem.

By the end of this course, students should successfully be able to:

- deal with problems of data-gathering, presentation, and interpretation.
- create graphical and numerical summaries of data
- develop an understanding of problems of measurement
- gain an understanding of the impact of statistical ideas in daily life and specific areas of study
- recognize the uses and misuses of statistics and related quantitative arguments
- understand fundamental concepts of probability and statistics
- utilize the use of computer programs in problems involving data analysis
- summarize data using summary measures and graphical techniques.
- identify an appropriate analysis for data collected in a study

- carry out such an analysis
- examine whether the assumptions behind the analysis are reasonable
- recognize the strengths or weaknesses of the study based on how the data was 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

- **General Education (GE)**

With the course objectives above, this course satisfies the Legacy General Education (GEL) requirement in **Mathematical and Quantitative Reasoning** and **Data Analysis** which has the following goals and expected learning outcomes, respectively:

Goals (Mathematical and Quantitative Reasoning)

Students develop skills in quantitative literacy and logical reasoning, including the ability to identify valid arguments, and use mathematical models.

Expected Learning Outcomes (ELO)

- Basic Computation
 1. Students demonstrate computational skills and familiarity with algebra and geometry.
 2. Students apply these skills to practical problems.
- Mathematical or Logical Analysis
 1. Students comprehend mathematical concepts and methods adequate to construct valid arguments.
 2. Students comprehend mathematical concepts and methods adequate to understand inductive and deductive reasoning
 3. Students comprehend mathematical concepts and methods adequate to increase their general problem solving skills.

Goals (Data Analysis)

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

Expected Learning Outcomes

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 Details - Canvas Assignment Schedule

Date	Name	Assignment Type	Points
	Data Collection Aug 25	Quiz	0
	Data Collection Aug 27	Quiz	0
8/25/26	HW0	Quiz	10

Course Details - Grading Policy

Category	Percentage (%)
Homework	15
Midterm Exam 1	25
Midterm Exam 2	25
Data Analysis Project	10
Final Exam	25
Total	100

- Homework

There will be regular homework assignments (about 8). Homework must be uploaded to Carmen by the posted deadline on the day it is due (typically by 11:59pm). Homework is not accepted by email. **Late homework is NOT accepted, but the lowest homework score will be dropped.** If you miss a homework assignment, you will receive a zero for the assignment (likely one that you will drop).

Homework preparation rules: Homework should be uploaded to Carmen in PDF format. PDF scans of handwritten pages are acceptable. Put your name and the homework assignment number at the top of the first page. Number all pages consecutively. Submit the problems in order, making sure that the computer output and discussion are placed together (do not put the computer output at the end of the homework). Include both R code and output in your homework and make it clear what parts of the output are relevant and show how they answer the questions posed in the homework.

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. Plagiarism is strictly prohibited. Feel free to ask me or grader for help after you have attempted the questions. Homework solutions will be available on the class web site after due date.

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. I will report serious academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

- **Exams**

There will be two midterms and one final exam. Please see Course Schedule for the corresponding dates. All exams are closed book/closed notes (except for the sheet of notes described next) – there are no make-up exams. You may use one 8.5x11 inch sheet of paper (both sides), with whatever facts, formulas, or explanations you find helpful, for each exam. A basic calculator is allowed – tablets, laptops, cellphones, AI devices and other communication devices are not. Statistical tables will be provided as needed.

- **Data Analysis Project**

Students will be randomly assigned to groups of 3–4 and will work collaboratively on a data analysis project. The project will involve formulating a research question, designing a data collection plan, collecting data, conducting data analysis, writing a report, and giving an in-class presentation.

Within each group, students will take on different primary roles and responsibilities for various stages of the project (e.g., data collection, analysis, or presentation), while working together to complete the overall project and final report.

The project grade will be based on the in-class presentation (50%) and the written report (50%). All members of the same group will receive the same project grade.

Course Details - Grading Scale

Letter Grade	Percentage Range
A	100% to 93%
A-	< 93% to 90%
B+	< 90% to 87%
B	< 87% to 83%
B-	< 83% to 80%
C+	< 80% to 77%

Letter Grade	Percentage Range
C	< 77% to 73%
C-	< 73% to 70%
D+	< 70% to 67%
D	< 67% to 60%
E	< 60% to 0%

Course Details - AI Use Policy

The main purpose of this course is for you to learn the material and to increase your understanding of statistics and data analysis. For the homework assignments, you can talk with fellow students and you can work on the problems with them. You may even wish to look on the web or use AI tools when working on the homework. This is acceptable, but your write-up should be your own – not a direct copy of a classmate's work, of a solution found online, or a write-up produced by AI. The exams will be in-class. For them, you will work solely on your own, so make sure that you have command of the material. For exams, a basic calculator will be permitted but cell phones will not be permitted. Tables will be provided as needed.

Note that this policy of open discussion and use of AI on the homework is specific to this course. Other instructors and other courses may well have a different policy. Make sure that you understand the policy for each course that you take.

Syllabus - University Policies

Office of Undergraduate Education - Standard Syllabus Statements

- [Academic Misconduct](#)
- [Religious Accommodations](#)
- [Accommodations for Disability and Illness](#)
- [Intellectual Diversity](#)
- [Grievances and Solving Problems](#)
- [Creating an Environment Free from Harassment, Discrimination, and](#)

Sexual Misconduct

- Copyrights
- Content Warnings
- Mental Health Support
- Resources for Military-Connected Students
- Campus-wide Class Cancellations