



THE OHIO STATE UNIVERSITY

STAT 2480.01

Statistics for the Life Sciences (23084)

Autumn 2026

Syllabus - Instructor Information

Nicole Kelbick

Professional Qualifications

Ph.D., Biostatistics, The Ohio State University

Master's, Biostatistics, The Ohio State University

Bachelor's, Mathematics, University of Dayton

Syllabus - Required or Recommended Readings

Textbook: *The Analysis of Biological Data*, by M. C. Whitlock and D. Schluter, 3rd ed., ISBN: 9781319226299.

Syllabus - Course Schedule

Week	Topic
1	Summarizing Data Graphically and Numerically
2	Probability (Definition, Rules, Conditional Probability, Law of Total Probability and Bayes Theorem)
3	Random Variables

Week	Topic
4	Hypothesis Testing and the Binomial Test
5	Goodness of Fit tests and the Poisson Distribution
6	Odds Ratios, Relative Risk and the Chi-Square Test
7	The Normal Distribution and the Central Limit Theorem
8	The t-Distribution and Confidence Intervals for a Single Mean
9	One-Sample t-test
10	Comparing Two Means: Paired and Unpaired t-tests and the Sign Test
11	ANOVA
12	Multiple (Pairwise) Comparisons
13	Correlation
14	Regression
15	Experimental and Observational Studies

Course Details - Instructor Contact Details

Name: Nicole Kelbick, PhD

Email: kelbick.1@osu.edu

Course Details - Office Hours

If the links don't work by just clicking on them, you may have to right click on the link and select the **Open link in a new tab** or copy and paste the web address into a web browser.

Office hours begin the [second](#) week of classes.

Monday and Wednesday 9:30am - 10:30am	https://osu.zoom.us/j/92772086990?pwd=rWFku060XQDSyZlaN9sVWjh4zmDaSf.1 Meeting ID: 927 7208 6990 Password: 467138
Monday and Wednesday 3:00pm - 4:00pm	https://osu.zoom.us/j/98002825630?pwd=brxeMMBdxNJu9QWwD0EKe6Wi7n7Ppo.1 Meeting ID: 980 0282 5630 Password: 347237
Tuesday 2:00pm - 3:00pm	https://osu.zoom.us/j/99293828418?pwd=Juspoqr4eIP3qJlwX1w2wsnKAQ8Zdw.1 Meeting ID: 992 9382 8418 Password: 742981
By Appointment	To set up a meeting, email instructor at kelbick.1@osu.edu .
Finals Week	To Be Determined

Math/Stat Learning Center (MSLC) Tutor Hours

The MSLC office hours will become available during the second week of the semester.

Monday - Friday <i>Times vary each day of the week.</i>	https://mslc.osu.edu/tutoring/statistics-shared-office-hours <i>Scroll down the MSLC website to see the Stat 2480 tutoring hours for both online and in-person tutoring.</i> <i>The weekly module announcements will contain information about the zoom links for the online tutoring hours when they become available.</i>
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Course Details - Additional Instructional Staff

Teaching Assistants

Chao Lin Chang

Zihan Zhang

Course Details - Class Meeting Details

Class Meeting Details: 01:50 PM-02:45 PM - Journalism Bldg 360 - MWF

Course Delivery

The course will be delivered as a mixture of 30% synchronous and 70% asynchronous (self-paced) formats.

Synchronous parts of the course involve meeting together to:

- review lecture material
- conduct R labs on Fridays
 - There are 11 labs total.
 - Students complete the labs in class the majority of the time.
- take exams (2 Midterm Exams and a Final Exam)
 - Exam dates and time appear in the Exam Information Module

located on the Carmen landing page.

Asynchronous parts include:

- reviewing the weekly announcements posted on Carmen
- studying the course material that is assigned each week.
- homework assignments via Achieve (See section on Course Materials)
- completing lab activity using the R statistical software (See section on Course Technology)
- occasionally watching lecture videos outside of class

The instructor and teaching assistant will hold weekly office hours via CarmenZoom. Refer to the **Exam Information Module** in Carmen for more detailed info including days, times and study materials. Information about how and when students can access free tutoring from the Mathematics and Statistics Learning Center (MSLC) is also be provided in Carmen and the Office Hours section of the syllabus.

Course Details - Course Description

Calculus-based introduction to the statistical analysis of biological data, including probability, common discrete and continuous distributions, experimental design, hypothesis testing, linear regression and correlation. Prereq: Math 1131, 1141, 1151, 1156, 1161.xx, or 1181H, or equiv, or permission of instructor. Not open to students with credit for 2450, 2450.01, 2450.02, 2480, 2480.02, or 3202.

Prerequisite(s) / Corequisites: Prereq: Math 1131, 1141, 1151, 1156, 1161.xx, or 1181H, or equiv, or permission of instructor. Not open to students with credit for 2450, 2450.01, 2450.02, 2480, 2480.02, or 3202.

Course Details - More About This Course

General Description

Statistical methods play an important role in the analysis of data collected in the biological sciences. This course will provide an introduction to the analysis of biological data in a statistical framework. The topics covered include the

definition of probability and manipulation of probabilistic quantities; the common discrete and continuous distributions used in modeling biological phenomena; experimental design; and statistical methods for testing hypotheses, parameter estimation and modeling.

Course Details - Course Learning Outcomes

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

1. Understand and discuss methods of collecting data by

- Providing examples of methods of random sampling
- explaining correct procedures for designing experiments and observational studies
- explaining uses and misuses of sample surveys
- using statistical tools for presentation of data and to understand presentations of data
- discussing when different types of graphical displays are appropriate and explaining proper methods of constructing graphical displays
- using appropriate summary statistics to describe the distribution of data
- By introducing statistical terminology used to describe data and distributions

2. Analyze data by

- constructing and interpreting confidence intervals
- conducting and interpreting hypothesis tests
- using simple linear regression for bivariate data

3. Understand basic probability and statistical concepts by

- presenting and applying rules of probability
- studying common discrete and continuous distributions used to model biological data
- discussing sampling distributions and the use of the Central Limit

Theorem as the foundation of inference

4. Evaluate statistical procedures and summaries by

- discussing assumptions and conditions for analysis procedures
- identifying sources of bias in sampling, experiment, and survey methods
- discussing appropriate nature and scope of conclusions for analysis procedures
- discussing case studies in the life sciences

GE Course Information

The following goals will be achieved by detailed study utilizing example data from the life sciences.

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 Details - Course Supplies

Course Materials

Required

- **Textbook:** *The Analysis of Biological Data*, by M. C. Whitlock and D. Schluter, 3rd ed., ISBN: 9781319226299.
- **The textbook and the accompanying homework assignments will be accessible via Achieve**, Macmillan's learning management system. Access is through CarmenBooks.
- **Using CarmenBooks, students will obtain publisher materials**

electronically via Carmen Canvas, saving up to 80% per title. The fee for this material is included as part of tuition and is listed as a CarmenBooks fee 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 CarmenBooks website, <https://affordablelearning.osu.edu/carmenbooks/students>.

- Need help with the textbook? **The publisher's technical support team can be reached by phone, chat, or by email via the Student Support Community.** To contact support please open a service request by filling out the webform at <https://www.macmillanlearning.com/college/us/contact-us>. (Privacy notice: <https://store.macmillanlearning.com/us/privacy-notice>).

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/>.

Necessary Equipment

- **Computer:** current **Mac** (OS X) or **PC** (Windows 8+) with high-speed internet connection **OR a tablet** with web-browser capabilities and high-speed internet connection
- **CarmenZoom text, audio, and video chat.** If you need technical assistance, either call 614-688-HELP, or refer to the online instructions: <https://resourcecenter.odee.osu.edu/carmenzoom>.

Necessary Software

- **No additional software is required beyond a web-browser.** Students will be given instructions for using the open-source R statistical software at the Ohio Supercomputer Center (OSC) through their web browser. A laptop or tablet can be used to access the software. This is the easiest way to access R and the relevant course data sets.
- This software package is also available as Free Software if a student chooses to download it to a personal computer instead of accessing it through OSC.
 1. You can download R for Windows, Mac, and Linux, from the CRAN archive at <https://cran.r-project.org>.
 2. A more user-friendly 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 <https://docs.posit.co/ide/user/#rstudio-ide-oss-downloads>. **Note that RStudio requires R to be installed first!**
 3. More details are provided in CarmenCanvas.
- **All Ohio State students are 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.
 1. 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>.

Course Details - Detailed Course Schedule

Week	Topic	Reading
1	Summarizing Data Graphically and Numerically Lab 1: Intro to R Software	Chps 1 - 3
2	Probability (Definition, Rules, Conditional Probability, Law of Total Probability and Bayes Theorem) Lab 2: Graphical and Numerical Summaries in R	5.1 - 5.3, 5.5 - 5.9
3	Random Variables Lab 3: Random Sampling	5.7 - 5.9
4	Hypothesis Testing and the Binomial Test Lab 4: Statistical Distributions in R	5.4, 6.1 - 6.7, 7.1 - 7.2, 7.4
5	Goodness of Fit tests and the Poisson Distribution Lab 5: Hypothesis Tests in R	8.1 - 8.4
6	Odds Ratios, Relative Risk and the Chi-Square Test Lab 6: Contingency Tables in R	9.1 - 9.4
7	The Normal Distribution and the Central Limit Theorem	10.1 - 10.6
8	The t-Distribution and Confidence Intervals for a Single Mean Lab 7: Normal Probability Plots; t-distribution	11.1 - 11.2, Chp 4
9	One-Sample t-test	11.3 - 11.4, 13.1, 13.3
10	Comparing Two Means: Paired and Unpaired t-tests and the Sign Test Lab 8: Inference for the Population Mean in R	12.1 - 12.3, 13.4
11	ANOVA Lab 9: Power of Hypothesis Tests	15.1 - 15.2
12	Multiple (Pairwise) Comparisons Lab 10: ANOVA in R	15.1 - 15.4
13	Correlation	16.1 - 16.5, 16.7 - 16.8

Week	Topic	Reading
14	Regression Lab 11: Regression in R	17.1 - 17.9
15	Experimental and Observational Studies	14.1 - 14.8

Course Details - Canvas Assignment Schedule

Date	Name	Assignment Type	Points
9/2/26	Lab 1 Quiz	Quiz	20
9/7/26	Ch 1 Assignment Problems	Assignment	50
9/7/26	Ch 2 Assignment Problems	Assignment	50
9/7/26	Ch 3 Assignment Problems	Assignment	50
10/7/26	Exam 1	Assignment	50
11/11/26	Exam 2	Assignment	50
12/4/26	Ch 5 Assignment Problems	Assignment	50
12/16/26	Exam 3	Assignment	60

Course Details - Grading Policy

Grade Components

Category	Percentage
Homework	20%
Lab Quizzes	20%
Exam 1	20%
Exam 2	20%
Final Exam	20%
Total	100%

Late Penalties

Homework assignments may be submitted up to a week late but will be penalized 5% for each day late.

Lab Quizzes may be submitted past the original deadline but 20% will be deducted for each day late.

Because of this generous late policy, there is no need to request an extension for lab quizzes and homework assignments, unless a student will be incapacitated for more than a week or has disability accommodations.

Strategy

Since multiple attempts for homework assignments and lab quizzes are allowed, it is in a student's best interest to use this to their advantage. This allows a student to maximize the contribution of each of these components towards their final grade. Each student is able to easily achieve a 20% for each of these two components by taking full advantage of re-doing assignments and lab quizzes repeatedly until they obtain the maximum points allowed.

Assignment Information

Homework: Required homework problems will be assigned for each topic covered in the course, and solutions will be submitted and graded via Achieve. Work through homework problems on your own in a timely manner in order to perform well in the class. **It is highly recommended students have a dedicated notebook** where homework problems are worked out so they can be referenced when studying for exams.

Labs: Lab exercises using the R software will be carried out approximately once per week. These lab exercises will be submitted via Carmen quizzes.

Exams: There will be two midterms exams and a final exam administered in-person. Statistical tables and formula sheets will be provided as needed. Dates of all exams are provided in Carmen.

Makeup exams: A valid excuse is needed to request a make-up exam. You must notify the instructor as soon as possible about such a situation. A make-up exam should be taken within a week of the missed exam. Exceptions to this policy will be permitted on a case-by-case basis and only in extreme situations.

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%
C	< 77% to 73%
C-	< 73% to 70%
D+	< 70% to 67%
D	< 67% to 60%
E	< 60% to 0%

Course Details - Instructor Policies

Course Attendance Policy

The course is primarily asynchronous. Attendance via zoom is required for midterms and the final exam unless other accommodations have been made with the instructor's permission. The first Friday of classes is typically reserved for a class meeting at the designated class time to go over the first lab together. This will be the first exposure to R Studio and will involve reviewing how to gain access to R Studio as well as how to utilize it to complete Lab 1. Students are not required to attend this session but highly encouraged to do so. A review video will be made available for those who are unable to attend Friday's session.

Communication

Email and office hours will be the primary mode of student to instructor communication in this course. Please begin your email's subject line with STAT 2480.02. Remember that all course email correspondence must be conducted using your valid OSU name.# email account.

At the beginning of each week's module, there will be a page containing announcements. YOU ARE EXPECTED TO REVIEW THEM AT THE BEGINNING OF EACH WEEK!! Other announcements and reminders will be made in class and/or via Carmen announcements.

Staff Feedback and Response Time

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

If you have questions about lecture content, homework, labs or exams, or notice any typos in the material, please message us directly via email.

Canvas Conversations/Email

The course instructor will reply to messages sent via Canvas Conversations or email within 48 hours on school days (Monday – Friday, excluding university holidays; list of holidays at <http://registrar.osu.edu/staff/bigcal.asp>).

Office Hours

Instructor office hours will be available weekly beginning the second week of the semester. The dates, times and zoom links will be posted in the syllabus which will be available on Carmen.

Communication Guidelines

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

- **Email** Subject line contains course the number: for example Stat 2480.02.
- **Writing style:** While there is no need to communicate 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.
- **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.

Course Details - Course Policies

Academic Integrity Policy

Policies for this online course

- **Homework:** Homework may be discussed with classmates or TAs but submitted homework assignments should represent your own efforts.
- **Lab activities:** can be completed in a “group setting” by collaborating with other students in the class. Help from sources outside of this class is not allowed.
- **Exams:** Must be completed by yourself, without any external help or communication.

You get out of this course what you put into it!! It is up to you to decide for yourself how much more knowledgeable you want to be by the end of this course (3+ months from now). The more you outsource your work, the less prepared for exams you will be and the harder it will be for you to apply this content to real life biological and medical research

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/>.

Course Details - AI Use Policy

Study Assistance

GenAI can fabricate information (for example, creating citations to sources that do not exist) or omit key information. You are ultimately responsible for the accuracy and integrity of your submitted work. Unless explicitly permitted below, representing AI-generated content as your own work is a violation of the Code of Student Conduct. Please check with your instructor if you have questions.

These levels may apply to the entire course or specific assignments, as indicated by the instructor:

- **Permitted:** You may use GenAI as a virtual tutor to explain concepts, quiz you on course topics, or summarize content you have personally authored (e.g., your own class notes). **It is not to be used to generate answers to homework assignments, lab quizzes or exams.**
- **Prohibited:** The materials in this course may be subject to copyright protection. **Do not input or allow AI to access external or instructor-created course materials (e.g., assigned readings, slides) without explicit instructor permission.** Do not use GenAI to outline, draft, translate, or write any part of an assignment.

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](#)