



# SYLLABUS

# STAT 3410

Principles of Data Collection and Analysis

Summer 2022 (full term)

3 credit hours

Online

## COURSE OVERVIEW

### Instructor

Instructor: Dr. Steephanson Anthonymuthu

Email address: [anthonymuthu.1@osu.edu](mailto:anthonymuthu.1@osu.edu) (preferred contact method)

Office hours: Virtual on Monday and Wednesday 10:00 am – 11:00 am

### Graders

Grader: Yingyu Cheng

Email address: [cheng.1753@buckeyemail.osu.edu](mailto:cheng.1753@buckeyemail.osu.edu)

### Prerequisites

STAT 3201 and STAT 3202 or permission of instructor

### Course description

This course covers principles of data collection and data analysis. The course introduces students to the primary ideas involved in designed vs. observational studies, and considers appropriate statistical methods for each. It also covers the basic principles of experimental design and the techniques used to analyze experiments that follow standard experimental designs. Specific designs to be covered include one-way ANOVA, two-and-higher-way ANOVA, factorial designs, block designs, and models with

random effects. The JMP software will be used in the course to carry out all analyses and to provide experience to students in data analysis.

## Course learning outcomes

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

- Grasp the basics of descriptive and inferential statistics for designed experiments and observational studies
- Understand principles of good design, such as randomization, replication, and blocking
- Appreciate the importance of the assumptions that statistical models are based on
- Understand and use appropriate statistical notation and terminology
- Understand the fundamental components of ANOVA models (e.g., main effects and interactions)
- Effectively implement statistical analyses for designed experiments in the JMP software
- Summarize an analysis appropriately

## HOW THIS ONLINE COURSE WORKS

**Mode of delivery:** The instructor will deliver live Zoom lectures during the scheduled class time. In addition to the lecture videos, weekly assignments will be posted on the class website. You will be given ample time to complete the assignments.

The instructor will hold weekly office hours via Zoom. The dates and times will be announced later and posted on the Carmen website. I am usually available to meet online by appointment if arrangements are made in a timely manner.

Synchronous attendance of lectures is **must**, but the lectures will be recorded and posted; however, midterm and final exams must be written synchronously. Material covered in the text should be read **in advance of the lecture**.

**Pace of online activities:** This course is divided into **weekly modules** that are released and posed on Carmen. Students are expected to keep pace with weekly deadlines but may schedule their efforts freely within that time frame.

**Credit hours and work expectations:** This is a **3-credit-hour course**. According to Ohio State policy ([go.osu.edu/credithours](https://go.osu.edu/credithours)), students should expect around 3 hours per week of time spent on direct instruction (instructor content and Carmen activities, for example) in addition to 6 hours of homework (reading and assignment preparation, for example) to receive a grade of (C) average.

**Attendance and participation requirements:** Because this is an online course, your attendance is based on your online activity and participation. The following is a summary of students' expected participation:

- **Participating in online activities for attendance: AT LEAST ONCE PER WEEK**  
You are expected to log in to the course in Carmen every week. (During most weeks you will probably log in many times.) 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 and live sessions: OPTIONAL**  
All live, scheduled events for the course, including my office hours, are optional.

## COURSE MATERIALS AND TECHNOLOGIES

### Textbooks

#### Required

- *Design and Analysis of Experiments*, 9th edition, by Douglas C. Montgomery, Wiley, 2017

### Course technology

#### Technology support

For help with your password, university email, Carmen, or any other technology issues, questions, or requests, contact the Ohio State IT Service Desk. Standard support hours are available at [ocio.osu.edu/help/hours](https://ocio.osu.edu/help/hours), and support for urgent issues is available 24/7.

- **Self-Service and Chat support:** [ocio.osu.edu/help](https://ocio.osu.edu/help)
- **Phone:** 614-688-4357(HELP)
- **Email:** [servicedesk@osu.edu](mailto:servicedesk@osu.edu)
- **TDD:** 614-688-8743

#### Technology skills needed for this course

- Basic computer and web-browsing skills
- Navigating Carmen ([go.osu.edu/canvasstudent](https://go.osu.edu/canvasstudent))
- CarmenZoom virtual meetings ([go.osu.edu/zoom-meetings](https://go.osu.edu/zoom-meetings))
- Recording a slide presentation with audio narration ([go.osu.edu/video-assignment-guide](https://go.osu.edu/video-assignment-guide))
- Recording, editing, and uploading video ([go.osu.edu/video-assignment-guide](https://go.osu.edu/video-assignment-guide))

## Required equipment

- Computer: current Mac (MacOs) or PC (Windows 10) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed and tested
- Microphone: built-in laptop or tablet mic or external microphone
- Other: a mobile device (smartphone or tablet) to use for BuckeyePass authentication

## Required software

- We will be using the JMP statistical computing software, which is available free of charge to students (see <https://ocio.osu.edu/software/software-request-instructions>).
- Microsoft Office 365: All Ohio State students are now eligible for free Microsoft Office 365. Full instructions for downloading and installation can be found at [go.osu.edu/office365help](https://go.osu.edu/office365help).

## Carmen access

You will need to use BuckeyePass ([buckeyepass.osu.edu](https://buckeyepass.osu.edu)) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device help article for step-by-step instructions ([go.osu.edu/add-device](https://go.osu.edu/add-device)).
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the Duo Mobile application ([go.osu.edu/install-duo](https://go.osu.edu/install-duo)) to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357(HELP) and IT support staff will work out a solution with you.

## GRADING AND FACULTY RESPONSE

### How your grade is calculated

ASSIGNMENT CATEGORY	POINTS
Homework	25
Exam 1	15
Exam 2	15
Final Exam	25
Attendance and Participation	5
Lecture Checks (Quizzes)	15
Total	<b>100</b>

*See course schedule below for due dates.*

### Descriptions of major course assignments

#### Homework (25%)

**Description:** Homework will be assigned weekly, or in some cases biweekly (generally when there is a short week due to holidays or exams). It will consist of mostly textbook-style problems, problems motivated by real-world applications, and analyses requiring the use of statistical software. Homework must be uploaded to Carmen at the beginning of class on the due date. The solutions may be handwritten and scanned, entered directly into a tablet, or typed. Any software output must be appended to the homework file prior to submission. **All work and software output must be uploaded as a single pdf file.** Please be sure that the questions are clearly labeled, all supporting work (including software output)

can be easily identified, and that all figures/tables are referenced and interpreted in the text. The lowest grade will be dropped.

**Academic integrity and collaboration:** You may work together on assignment problems, but each student must hand in his or her own work, written in his or her own words. Do not copy any part of another student's homework including computer code or 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. Sharing or disseminating solutions, or in any way knowingly enabling others to commit academic misconduct also constitutes academic misconduct, and will be reported. If you have any questions about what is allowed, **please ask**.

## Exams (55%)

**Description:** There will be two midterm exams and one final exam.

**Academic integrity and collaboration:** You must complete the midterm and final exams yourself, **without any external help or communication**. You may use your notes and the textbook. Students are **strongly advised** to prep a formula highlight sheet in advance.

## Attendance and Participation (5%)

**Attendance is mandatory** and will be taken daily. Each class begins promptly on time. All absences must be communicated in advance. Students get one free absence for an emergency. Excused absences require some indication that you have put the effort in to make up the material, such as by watching the lecture recording and discussing the material or asking relevant questions in office hours. Whether an absence is excused is entirely at the discretion of the professor. Health-related absences should be documented with a doctor's note. Strong prior attendance, participation, and advance notice will help your case.

Participation includes active engagement in the class by being physically and mentally present and may also include asking and answering questions (in person and via Carmen), attending office hours, or demonstrating effort and engagement in the course.

Attendance and Participation progress will be observed by the instructor in a series of events and will be recorded.

## Lecture Checks (Quizzes)(15%)

Lecture checks will comprise 15% of your grade for the course. These short, graded assignments will frequently be given during or after lectures. The purpose of these assignments is to give you practice, ensure you are staying up to date with course content, incentivize attendance and participation, and to give me a chance to quickly find and address any misconceptions. If you do not attend lecture, you

cannot attempt, submit, or receive credit for these assignments. The lowest lecture assignment grade will be dropped.

## Late assignments

Assignment solutions will be posted shortly after submission. No late assignments will be accepted without prior permission or formal documentation. Please refer to Carmen for due dates.

Accommodations can be made in case of severe illness, so please notify me as soon as possible if this situation arises.

## Grading scale

93–100: A  
90–92.9: A-  
87–89.9: B+  
83–86.9: B  
80–82.9: B-  
77–79.9: C+  
73–76.9: C  
70–72.9: C-  
67–69.9: D+  
60–66.9: D  
Below 60: E

## Instructor 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 **614-688-4357(HELP)** at any time if you have a technical problem.)

- **Grading and feedback:** For large weekly assignments, you can generally expect feedback within **7 days**.
- **Email:** I prefer to communicate via email ([Richards.1227@osu.edu](mailto:Richards.1227@osu.edu) not @buckeyemail.osu.edu). **Please write “STAT 3410” somewhere in the subject line**, as this will help me to quickly identify and reply to class emails. It is reasonable to expect a response within **one business day**.
- **Discussion board:** I will check and reply to messages in the discussion boards every **24 hours on school days**.

## OTHER COURSE POLICIES

## 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. A more conversational tone 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 integrity policy

See **Descriptions of major course assignments**, above, for my specific guidelines about collaboration and academic integrity in the context of this online class.

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/>.

**If I suspect that a student has committed academic misconduct in this course, I am obligated by university rules to report my suspicions to the Committee on Academic Misconduct.** If COAM determines that you have violated the university’s *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- Committee on Academic Misconduct web page ([go.osu.edu/coam](http://go.osu.edu/coam))
- Ten Suggestions for Preserving Academic Integrity ([go.osu.edu/ten-suggestions](http://go.osu.edu/ten-suggestions))

## Student Services and Advising

University Student Services can be accessed through BuckeyeLink. More information is available here:



<https://contactbuckeyelink.osu.edu/>

**FOR UNDERGRAD COURSES:** Advising resources for students are available here:

<http://advising.osu.edu>

**FOR GRADUATE COURSES:** List your department's advising resources here.

## 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. A good faith effort has been made to cite work inherited from previous instructors, where the source is known. Citations may not appear on graded work (to avoid students looking up answers).

## 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)

## Commitment to a diverse and inclusive learning environment

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

## Land Acknowledgement

We would like to acknowledge the land that The Ohio State University occupies is the ancestral and contemporary territory of the Shawnee, Potawatomi, Delaware, Miami, Peoria, Seneca, Wyandotte, Ojibwe and Cherokee peoples. Specifically, the university resides on land ceded in the 1795 Treaty of Greenville and the forced removal of tribes through the Indian Removal Act of 1830. I/We want to

honor the resiliency of these tribal nations and recognize the historical contexts that has and continues to affect the Indigenous peoples of this land.

More information on OSU's land acknowledgement can be found here:

<https://mcc.osu.edu/about-us/land-acknowledgement>

## Your mental health

As a student you may experience a range of issues that can cause barriers to learn, 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. No matter where you are engaged in distance learning, The Ohio State University's Student Life Counseling and Consultation Service (CCS) is here to support you. If you find yourself feeling isolated, anxious or overwhelmed, on-demand resources are available at [go.osu.edu/ccsondemand](https://go.osu.edu/ccsondemand). 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 Prevention Hotline at 1-800-273-TALK or at [suicidepreventionlifeline.org](https://suicidepreventionlifeline.org). The Ohio State Wellness app is also a great resource available at [go.osu.edu/wellnessapp](https://go.osu.edu/wellnessapp).

## ACCESSIBILITY ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

### Requesting accommodations

The university strives to make all learning experiences as accessible as possible. 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; 098 Baker Hall, 113 W. 12<sup>th</sup> Avenue.

### Accessibility of course technology

This online course requires use of CarmenCanvas (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.

- Canvas accessibility ([go.osu.edu/canvas-accessibility](https://go.osu.edu/canvas-accessibility))
- Streaming audio and video
- CarmenZoom accessibility ([go.osu.edu/zoom-accessibility](https://go.osu.edu/zoom-accessibility))
- Collaborative course tools

## **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.

## **ACKNOWLEDGEMENT**

Thank you to Dr. Oksana Chkrebti and Dr. Andrew Richards for their kind sharing of advice and course materials in preparation for this semester.

# COURSE SCHEDULE

Refer to the Carmen course for up-to-date assignment due dates.

#	Day	Week	Topic to be covered*
1	Wednesday, May 11	1	Course introduction and logistics
2	Friday, May 13	1	Review of basic principles of statistical inference
3	Monday, May 16	2	Review of basic principles of statistical inference
4	Wednesday, May 18	2	Review of one-sample tests (simple hypotheses)
5	Friday, May 20	2	Review of one-sample tests (simple hypotheses)
6	Monday, May 23	3	One-sample tests (composite hypotheses)
7	Wednesday, May 25	3	One-sample tests (composite hypotheses)
8	Friday, May 27	3	One-sample tests (composite hypotheses)
9	Monday, May 30	4	Momorial Day, no classes
10	Wednesday, June 1	4	One-sample tests (composite hypotheses)
12	Monday, June 6	5	Two-sample tests
13	Wednesday, June 8	5	Exam review
14	Friday, June 10	5	Exam 1 - hypothesis testing
15	Monday, June 13	6	Two-sample tests
16	Wednesday, June 15	6	Two-sample tests
17	Friday, June 17	6	Two-sample tests
18	Monday, June 20	7	Juneteenth National Independence Day - no classes
19	Wednesday, June 22	7	Modeling and designs with one source of variation
20	Friday, June 24	7	Modeling and designs with one source of variation
21	Monday, June 27	8	Modeling and designs with one source of variation
22	Wednesday, June 29	8	Modeling and designs with one source of variation
24	Monday, July 4	9	Independence Day - no classes, offices closed
25	Wednesday, July 6	9	Checking model assumptions
26	Friday, July 8	9	Sample size determination
27	Monday, July 11	10	Inferences about contrasts and treatment means
28	Wednesday, July 13	10	Experiments with multiple crossed treatment factors
29	Friday, July 15	10	Experiments with multiple crossed treatment factors
30	Monday, July 18	11	Experiments with multiple crossed treatment factors
31	Wednesday, July 20	11	Experiments with multiple crossed treatment factors
32	Friday, July 22	11	Experiments with multiple crossed treatment factors
33	Monday, July 25	12	Fitting multi-factor models in JMP
34	Wednesday, July 27	12	Block designs
35	Friday, July 29	12	Block designs