



THE OHIO STATE UNIVERSITY

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COLLEGE OF ARTS AND SCIENCES

# **SYLLABUS: STAT 4202**

## **INTRODUCTION TO MATHEMATICAL STATISTICS II**

### **SPRING 2021**

## **Course overview**

### **Instructor**

Instructor: Dr. Lo-Bin Chang

Email address: [chang.1539@osu.edu](mailto:chang.1539@osu.edu)

Office hours: Virtual Hours via Carmen Zoom: Tuesday 8 am-9 am, Wednesday 9:40 am-10:40 am or by appointment

### **Teaching Assistant**

Liu, Renxiong (email: [liu.6732@osu.edu](mailto:liu.6732@osu.edu) )

Liu, Yongqi (email: [liu.8224@osu.edu](mailto:liu.8224@osu.edu) )

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## Course description

This course is the second part in a series of two courses (STAT 4201-STAT 4202) which cover the fundamentals of mathematical statistics and statistical inference. STAT 4202 focuses on the statistical inference part and covers topics such as: point estimation, interval estimation, hypothesis testing, regression, and non-parametric tests.

Prerequisites: C- or better in 4201, Math 4530, or 5530H, or permission of instructor. Not open to students with credit for 3202, 6201, 6302, or 6802.

## Course learning outcomes

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

- Calculate and evaluate point estimators.
- Formulate, construct and interpret confidence intervals about parameters in a statistical model.
- Formulate statistical hypotheses, construct appropriate hypotheses tests and interpret results
- Formulate linear regression models, fit these models and interpret the results.
- Construct distribution-free hypotheses testing procedures.

## GE Course Information

This course satisfies the requirement in Data Analysis. Upon successful completion of this course students will be able to:

- Understand basic concepts of statistics and probability;
- Comprehend methods needed to analyze data and critically evaluate statistical arguments;
- Recognize the importance of statistical ideas.

## Course materials

### Required textbook:

John E. Freund's Mathematical Statistics with Applications (8th edition) by Irwin Miller and Marylees Miller (ISBN-13: 978-0321807090).

## 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 for online courses

- Basic computer and web-browsing skills
- Navigating Carmen

### Technology skills necessary for this specific course

- CarmenZoom
- Collaborating in CarmenWiki
- Recording a slide presentation with audio narration
- Recording, editing, and uploading video

### 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.**
- [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>.

## Course delivery

The course will be a mix of synchronous and asynchronous content. Synchronous content will be presented live over CarmenZoom, and asynchronous content will be delivered by recorded lectures posted on the class website. We will have our first synchronous lecture at 3 pm on January 11. Detailed instructions for the synchronous/asynchronous lectures will be announced every weekend.

**Note that the live lectures and students' participation may be recorded and posted. If you would not like to be recorded, please discuss the materials after I stop recording or during my office hours.**

Each week, we will cover approximately 165 minutes of content in total. You will be responsible for watching any live content or recorded videos and studying the material that is assigned. In addition to the lecture videos, assignments will be posted on the class website. You will be given ample time to complete the assignments.

You are assigned to a recitation section. Note that recitation activities will take place via a live CarmenZoom meeting at the times posted on the registrar website.

The instructor will hold weekly office hours via CarmenZoom. The times are given above (see Instructor section).

# Grading and faculty response

## Grades

Assignment or category	Percentage
Homework	15
Midterm 1	25
Midterm 2	25
Final Exam	35
<b>Total</b>	<b>100</b>

## Assignment information

Homework assignments will be posted on the course website almost every week. All homework must be submitted online as a PDF file through the class website. For each homework assignment, only one or two problems will be graded (by your TA). You are encouraged to discuss homework problems with other students, but you must write your own solutions. Directly copying solutions from other students or sources is academic misconduct.

The grader for the course does not have the time to provide detailed explanations on each question that is graded. To make up for this, I will endeavor to create homework solutions that are detailed enough to allow you to understand how the question could be approached.

## Late assignments

Typically, late assignments will not be accepted. However, If you are unable to complete an assignment on time, please get in touch with me *as soon as possible* so we can discuss your situation.

## Exams

All exams are closed book/closed notes and will be proctored online. I will proctor and record the exam through zoom. You will need to prepare a webcam and take the exam in front of the webcam. Further details will be given in advance of each exam. The tentative schedule is as follows:

Midterm I: 3:00pm~3:55pm, Monday, February 15  
Midterm II: 3:00pm~3:55pm, Monday, March 22  
Final Exam: 4:00pm~5:45pm, Wednesday, April 28

If you plan to have a conflict with an exam, please get a permission from the instructor prior to any action (e.g., book a flight or hotel, accept an invitation). If you cannot take an exam due to a valid excuse (e.g., illness), please notify the instructor by email before the exam and provide appropriate documents (e.g., doctor's notes). If you miss a midterm exam with a permission or a valid excuse, we will add the weight of the midterm to the weight of the final exam to compute your final grade. If you miss the final exam with a permission or a valid excuse, we will arrange a makeup exam for you.

## 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

## 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 large weekly assignments, you can generally expect feedback within **7-14 days**.

### E-mail

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

## Attendance, participation, and discussions

Students may need to miss classes, 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.

## Student participation requirements

Because this is a distance-education course, your attendance is based on your online activity and participation. The following is a summary of everyone's expected participation:

- **In live lectures:**  
Students will be expected to participate, discuss, and answer questions in online live 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. (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: OPTIONAL OR FLEXIBLE**  
All office hours, are optional. If you are not available during my scheduled office hours, you can email me to schedule a different time to get my help.

## 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.

## 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 July 1 on the Safe and Healthy website (<https://safeandhealthy.osu.edu>).

## Potential disruptions to instruction

Contingencies to be addressed:

- Student is unable to attend class because of positive diagnosis, symptoms, or quarantine required following contact tracing.
- Instructor is unable to be present in person because of positive diagnosis, symptoms, or quarantine following contact tracing.

## Student academic services

Student academic services offered on the OSU main campus  
<http://advising.osu.edu/welcome.shtml>.

## Student support services

Student support services offered on the OSU main campus <http://ssc.osu.edu>.

## Academic integrity policy

### Policies for this online course

- **Exams:** You must complete the midterm and final exams yourself, without any external help or communication.
- **Written assignments:** Your written assignments, including discussion posts, should be your own original work.

### 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 (Recommended)

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 online 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.

- [Carmen \(Canvas\) accessibility](#)
- Streaming audio and video
- Synchronous course tools

## 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](https://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](https://suicidepreventionlifeline.org)

## 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
1	1/11-1/15	Introduction to point estimation, Unbiased Estimators, Efficiency
2	1/18-1/22	Consistency, Sufficiency, Robustness
3	1/25-1/29	Methods of moments, Maximum likelihood estimation
4	2/1-2/5	Estimation of means and proportions / differences in means and proportions
5	2/8-2/12	Estimation of variances / Ratio of two variances
6	2/15-2/19	Hypothesis testing, Neyman-Pearson lemma
7	2/22-2/26	Power function, Likelihood ratio tests
8	3/1-3/5	Tests for differences in two means, Tests concerning variances and proportions
9	3/8-3/12	Tests concerning differences among k proportions,

		<b>Analysis of r x c tables</b>
<b>10</b>	<b>3/15/3/19</b>	<b>Analysis of r x c tables, Goodness of fit tests</b>
<b>11</b>	<b>3/22-3/26</b>	<b>Linear regression, The method of least squares regression</b>
<b>12</b>	<b>3/29-4/2</b>	<b>Normal regression analysis, Normal correlation analysis</b>
<b>13</b>	<b>4/5-4/9</b>	<b>Multiple linear regression, Introduction to nonparametric tests</b>
<b>14</b>	<b>4/12-4/16</b>	<b>The sign test, The signed-rank test</b>
<b>15</b>	<b>4/19-4/23</b>	<b>Rank-sum tests: The U test and H test, Tests based on runs</b>