SYLLABUS: STAT 4202
INTRODUCTION TO MATHEMATICAL STATISTICS II
AUTUMN 2021

Course overview

Instructor

Instructor: Prateek Sasan
Email address: sasan.1@osu.edu
Office hours – (Hybrid - Cockins Hall 217 or Carmen Zoom) : Tuesday 1PM – 2PM
Office hours – (Virtual Hours via Carmen Zoom) : Thursday 9AM – 10AM

Teaching Assistants and Grader

Renxiong Liu – email: liu.6732@osu.edu – MSLC tutoring hours: TBD
Amartya Ghosh – email: ghosh.147@osu.edu – MSLC tutoring hours: TBD
Wenxin Du – email: du.888@osu.edu – MSLC tutoring hours: TBD

Note: questions about homework grading should be directed to the instructor. Quiz and exam grading questions should be directed to your recitation leader first.

MSLC information and links

Free online drop-in tutoring for this course is available through the Mathematics and Statistics Learning Center (MSLC). Details about tutoring through the MSLC are available here. Specific STAT4202 tutoring hours will be made available here when finalized.

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: decision theory, point estimation, hypothesis testing, regression, ANOVA 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. GE data anly course.

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.
- Formulate one-way ANOVA 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
- **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

- On occasion, I may use the statistical software package called R (The R Project for Statistical Computing; http://www.r-project.org/) to illustrate certain aspects. However, this software is not a requirement for this class. If you wish to download it, here is the information.
    - 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 class is scheduled to meet on MWF from 03:00pm – 03:55pm. For the Autumn 2021 offering, the course will be taught fully online, and no in-person meetings will take place. In addition to the lectures, there will be one recitation each week.

Each week, live lectures will be delivered through CarmenZoom at the scheduled class times (see above). These lectures will be recorded and posted on the class website. The recorded lectures would be posted after the lecture. Links for the Zoom meetings will be posted well in advance on Carmen.

On occasion, instructional videos may be posted to the class website. Such videos will replace a live Zoom lecture and will contain new course material and worked examples. You will be responsible for watching the videos, studying the new material and working through the examples presented in the videos or assigned as an exercise.

You are assigned to a recitation section. Each week, a recitation activity will take place either via a live meeting or through recitation assignments posted on the class website. Live recitation activities will take place at the times posted on the registrar website.

The vast majority of the course can be completed asynchronously, meaning that you will be able to study materials and work on assessments according to your own schedule. Throughout the course, the balance between synchronous (live lectures) and asynchronous (posted videos) may change, based on the specific topic we are covering, or other factors.

Weekly office hours will be held both in person and via CarmenZoom, at the times given above (see Instructor section).

Grading and faculty response

Grades

Assignment or category	Percentage
Homework	20
Quizzes	20
Midterm 1	20
Midterm 2	20
Final Exam	20
Total	100

Assignment information

Homework: There will be (approximately) biweekly homework assignments posted on the course website. One question would be graded in each homework. The question to be graded would be specified and you would only submit the answer to the specific question.

Quizzes: There will be (approximately) biweekly quizzes. These will be administered at the start of the recitation and would be one of the ungraded problem from the previous homework or a question very similar to that.

Exams: There will be two midterm exams and one final exam. All exams will be delivered remotely, via Carmen. The midterms will take place during lecture time and the final exam will take place at the time and date established by the University. Information about the exams will be posted well in advance through the course website. The **tentative** dates for the exams are as follows:

Exam 1: Wednesday, October 6 (3.00 PM – 3.55PM)

Exam 2: Friday, November 5 (3.00 PM – 3.55PM)

Final Exam: Friday, December 10 (12.00 PM – 1.45 PM)

Late assignments

Generally late assignments are not accepted and written documentation is required for missed assignments. 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.

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 days**.

E-mail

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

Discussion board

I will check and reply to messages in the discussion boards every **24 hours on school days**.

Attendance, participation, and discussions

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:

- **Logging in**: **AT LEAST ONCE PER WEEK**
  Be sure you are logging in to the course in Carmen each week, including weeks with

holidays or weeks with minimal online course activity. (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 OR FLEXIBLE**
  All live, scheduled events for the course, including my office hours, are optional. For live lecture presentations, I will provide a recording that you can watch later. If you are required to discuss an assignment with me, please contact me at the beginning of the week if you need a time outside my scheduled office hours.

- **Participating in discussion forums**: **SEVERAL TIMES PER WEEK**
  As participation, each week you can expect to post several times as part of our substantive class discussion on the week's topics.

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.

I expect that you will read and follow the guidelines and requirements for campus safety, which are available at https://safeandhealthy.osu.edu.

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

- **Quizzes and exams**: You must complete quizzes, midterms, and final exams yourself, without any external help or communication.

- **Written assignments**: Your written assignments, including discussion posts, should be your own original work. In formal assignments, you should cite the ideas and words of your research sources. You are encouraged to ask a trusted person to proofread your assignments before you turn them in--but no one else should revise or rewrite your work.

- **Reusing past work**: In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with me.

- **Falsifying research or results**: All research you will conduct in this course is intended to be a learning experience; you should never feel tempted to make your results or your library research look more successful than it was.

- **Collaboration and informal peer-review**: The course includes many opportunities for formal collaboration with your classmates. While study groups and peer-review of major written projects is encouraged, remember that comparing answers on a quiz or assignment is not permitted. If you're unsure about a particular situation, please feel free just to ask ahead of time.

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

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, Kellie Brennan, at titleix@osu.edu

Accessibility accommodations for students with disabilities

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; 614-292-3307; 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
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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 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

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 (Readings)
1	8/23/21 – 8/29/21	Introduction; Introduction to point estimation (10.1-10.2)
2	8/30/21 – 9/5/21	Consistency, Sufficiency, Robustness (10.3-10.5)
3	9/6/21 – 9/12/21	Methods of moments / maximum likelihood estimation (10.7-10.8)
4	9/13/21 – 9/19/21	Estimation of means and proportions / differences in means and proportions (11.1-11.5)
5	9/20/21 – 9/26/21	Estimation of variances / Ratio of two variances (11.6-11.7)
6	9/27/21 – 10/3/21	Hypothesis testing; Neyman-Pearson lemma (12.1-12.3)
7	10/4/21 – 10/10/21	Power function; likelihood ratio tests (12.5-12.6)
8	10/11/21 – 10/17/21	Tests for differences in two means; tests concerning variances and proportions (13.1-13.5)
9	10/18/21 – 10/24/21	Goodness of fit tests; analysis of r x c tables (13.7-13.8)
10	10/25/21 – 11/31/21	Linear regression / least squares regression (14.1-14.3)
11	11/1/21 – 11/7/21	Normal regression analysis / correlation analysis (14.4-14.5)
12	11/8/21 – 11/14/21	Multiple regression / Design of experiments (14.6)
13	11/15/21 – 11/21/21	One-way ANOVA (15.1-15.6)
14	11/22/21 – 11/28/21	Non-parametric tests (16.1-16.7)
15	11/29/21 – 12/3/21	Decision theory (9.1-9.6)