



THE OHIO STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

SYLLABUS: STAT 4202 (4.0 CREDIT HOURS) INTRODUCTION TO MATHEMATICAL STATISTICS II SPRING 2022

Course overview

Instructor

Instructor: Gavin Collins

Email address: collins.1681@osu.edu

Office hours: Monday 4:00 PM – 5:00 PM, Tuesday 4:00 PM – 5:00 PM, or by appointment

Office Location: Cockins Hall, Room 217

Teaching Assistants

Yongqi Liu – email: liu.8224@osu.edu

Renxiong Liu – email: liu.6732@osu.edu

Note: Questions about homework and quiz grading should be directed to a teaching assistant first. Exam grading questions should be directed to the instructor.

MSLC information

Free drop-in tutoring for this course is available through the Mathematics and Statistics Learning Center (MSLC) beginning January 18th. In-person tutoring will take place in Cockins Hall, Room 122, from 12:40-1:40pm Tuesdays-Fridays. Online tutoring will take place at the following times, using the respective Zoom links:

Monday, 11:30 a.m. – 12:30 p.m.

<https://osu.zoom.us/j/97830921241?pwd=dEJLRFFOWTZ5MDU3OUFidW4yTkMwdz09>

Meeting ID: 978 3092 1241

Password: 507743

Thursday, 10:20 a.m. – 12:30 p.m.

<https://osu.zoom.us/j/97182078358?pwd=V3YySlpvR1djV3VwUVFjV3grRm5MUT09>

Meeting ID: 971 8207 8358

Password: 528567

Thursday, 1:50 – 2:50 p.m.

<https://osu.zoom.us/j/93780096174?pwd=SDVjV3VSUW5lL0tzdE1YeE50VVZ3dz09>

Meeting ID: 937 8009 6174

Password: 825410

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 only 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 GE requirement in Data Analysis. The goal of the course is to help students develop skills in drawing conclusions and critically evaluating results based on data. 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).

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 fee* on your Statement of Account. 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](#).

To access the textbook, just click on "CarmenBooks" in the menu on the left-hand side of the screen on our class Carmen page, and follow the on-screen instructors, including signing a form.

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

Optional 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 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 3:00pm – 3:55pm in Jennings Hall, room 001. For the Spring 2022 offering, the course is slated to be taught fully in-person. Incomplete lectures notes will be posted on Carmen before each lecture. Students are expected to fill in the blanks during the lecture, and to take additional notes on the examples covered in class. Students are also expected to participate by asking and answering questions.

On occasion, instructional videos may be posted to the class website. Such videos will replace a live 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.

In addition to the lectures, there will be one recitation each week. You have registered for a recitation section. Each week, a recitation activity will take place at the times and locations posted on the registrar website. Quizzes will be given during recitation.

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

Grading and faculty response

Grades

Assignment or category	Percentage
Homework	20
Quizzes	20
Exam 1	20
Exam 2	20
Exam 3	20
Total	100

Assignment information

Homework: I will upload homework problems to Carmen. Assignments and due dates will be provided at least one week ahead of time. **Homework will be due on Wednesdays at 2:45pm (15 minutes before our lecture), and must be submitted as a pdf document on Carmen.** Students are required to complete all homework problems, but I will specify only one or two of these for which students will be required submit solutions to be graded. Each student must write and submit their own solutions.

Quizzes: Each time a homework assignment is due, there will be a quiz given during the following recitation. Each quiz will consist of a single problem, taken with minor modification from the homework assignment due that day. You will be given a sufficiently large time window, but there will be a time limit for you to complete the quiz. Quizzes will be closed-note, closed-book, and are to be completed individually for each student.

Exams: There will be two midterm exams and one final exam. All exams will be delivered in-person, with midterm exams administered during lecture. Tentative exam dates are written in the tentative course schedule on the last two pages of this syllabus, but these dates are subject to change; I will formally finalize and announce exam dates at least one week ahead of time. The final exam will take place at the time and date established by the university, which is currently set for **Friday, April 29 from 4:00pm – 5:45pm**. Information about the exams will be given well in advance of the exam dates.

Late assignments

Generally late assignments are *not* accepted and written documentation is required to justify making up a missed assignment. 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

Grading and feedback

For homework assignments, and quizzes you can generally expect feedback within **7 days**. For exams, you can expect feedback within 14 days, but we will try to get feedback to you as soon as possible.

E-mail

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

Attendance, participation, and discussions

Student participation requirements

Students are expected to attend all lecture and recitation meetings, ask and answer questions, and communicate in a respectful manner at all times. If you need to miss lecture, please contact one of your classmates to get a copy of the completed lecture notes, and to catch up on any announcements you may have missed. Please also take advantage of optional opportunities to meet with me and/or the TAs during office hours. We're here to help!

Discussion and communication guidelines

Above all, please remember to be respectful and thoughtful in your communications in class and electronically. Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably.

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 should be your own original work. In formal assignments, you should cite the ideas and words of your 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 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. See [Carmen \(Canvas\) accessibility](#) for additional information.

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)

Dates	Topics (Readings)
Jan 10	Review and Introduction
Jan 12, 14, 19	Estimators, Bias, and MSE (10.1-10.3)
Jan 21, 24	Consistency and Sufficiency (10.4-10.5)
Jan 26, 28, 31	Method of Moments and Maximum Likelihood Estimation (10.7-10.8)
Feb 2, 4, 7, 9	Estimation of means, proportions, and variances (11.1-11.7)
Feb 11	Review for Exam 1
Feb 14	Exam 1
Feb 16, 18, 21	Hypothesis Testing (12.1-12.3)
Feb 23, 25, 28	The Likelihood Ratio Test (12.4-12.6)
Mar 2, 4, 7, 9	Tests for means, variances, and proportions (13.1-13.6)
Mar 11	Tests for Independence (13.7)
Mar 14, 16, 18	Spring Break
Mar 21	Tests for Goodness of Fit (13.8)
Mar 23	Intro to Linear Regression (14.1-14.2)
Mar 25	Review for Exam 2
Mar 28	Exam 2
Mar 30; Apr 1, 4	Linear Regression and Correlation (14.3-14.5)
Apr 6, 8, 11	Nonparametric Tests (16.1-16.4)
Apr 13, 15	Analysis of Variance (15.1-15.2)
Apr 18, 20, 22	Decision Theory and Bayesian Estimation (9.1-9.6; 10.9)

Dates	Topics (Readings)
Apr 25	Review for Exam 3
Apr 29	Exam 3: Final Exam (4pm-5:45pm)