



THE OHIO STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

SYLLABUS: STAT 6802 STATISTICAL THEORY II SPRING 2021

Course overview

Instructor

Instructor: Mario Peruggia

Email address: peruggia@stat.osu.edu

Phone number: 614-292-0963

Office hours: Virtual Hours via CarmenZoom: Monday 3:00-4:00 pm and Thursday 1:30-2:30 pm. The instructor will also be available to answer any questions via by appointment.

Office Location: 205A Cockins Hall

Grader or Teaching Assistant

Grader: Zhizhen Zhao

Email address: zhao.3053@osu.edu

Office hours: Virtual Hours via CarmenZoom: Tuesday 2:00-3:00 pm and Wednesday 3:00-4:00 pm

Course description

Statistics 6802 is the second half of a two-course sequence on probability and statistical inference. As in Statistics 6801, the emphasis is on a rigorous theoretical development of the modeling and inferential tools needed in statistical practice and research.

Course learning outcomes

An important course objective is for the students to become comfortable with the formulation, conceptualization, and execution of theoretical and methodological ideas, as they relate to sound modeling and data analysis practice.

The course will cover some introductory elements of Decision Theory and selected topics from Chapter 7 (Point Estimation), 8 (Hypothesis Testing), 9 (Interval Estimation), and 10 (Asymptotic Evaluation) of the textbook.

A more detailed, tentative course plan is provided at the end of this document.

Course materials

Required

Casella, G. and Berger, R.L. (2001), "Statistical Inference," 2nd edition. Cengage Learning (print).

Optional materials

Some topics covered in the course will be based on material presented in additional books and articles. Appropriate references will be provided as needed.

Course technology

The course is scheduled to be offered in person. However, the first two weeks of the course will be offered online via synchronous Zoom sessions at the scheduled class times. Because of this and to be able to attend office hours and complete some of the course requirements, certain technical skills for online courses will be relevant. These skills should already be familiar to all Stat 6801 students.

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
- Ability to upload homework/quizzes/exams to Carmen (Word or PDF format)

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

- [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 is scheduled to be offered in person. However, the first two weeks of the course will be offered online via synchronous sessions. Zoom links for these synchronous sessions will be listed on Carmen. These sessions will take place during the scheduled class times, MWF 8:50-10:05.

When in person instruction resumes, we will meet MWF 8:50-10:05 in Student Academic Services 289.

Grading and faculty response

Grades

Assignment or category	Percentage
Quizzes	50%
Homework	20%
Final Exam	30%
Total	100

Assignment information

Grades will be recorded on the class website.

Homework: There will be regular homework assignments (12 are scheduled as of now). Homework must be uploaded to Carmen by the posted deadline on the day it is due (typically the beginning of class on a Friday, but the schedule may need to be adjusted). Homework is **not** accepted by email. Late homework is not accepted, but the lowest homework score will be dropped. You are encouraged to work together on the homework, but do not copy any part of a homework. Each student must produce his/her own homework to be handed in.

Feel free to ask me for help after you have attempted the questions. The grader for the course does not have the time to provide detailed explanations on each question. To make up for this, I will try to prepare homework solutions detailed enough to allow you to understand how the question could be approached. Homework solutions will be available on the class web site.

Quizzes: Short quizzes (11 are scheduled as of now) will be given regularly. The quizzes will be available on Carmen between 8:00 am and 11:59 pm on their due dates (typically on a Tuesday, but the schedule may need to be adjusted). Within this time window, you will have 30 minutes to work on the quiz and upload your answers to Carmen. Late quizzes are not accepted, but the lowest score will be dropped.

Final exam: The final exam is scheduled for Wednesday Apr 28, 10:00 am - 11:45 am. The exam will be available on Carmen during that time and the answers must be uploaded to Carmen by 11:45.

All quizzes and the final exam are **closed book/closed notes**. There are no make-up exams. A basic calculator is allowed – tablets, laptops, and cellphones can be used to typeset, scan, and upload your answers to Carmen, but cannot be used as communication devices. Statistical tables will be provided as needed.

Homework, quiz, and exam preparation rules: Homework, quizzes and final exam may be uploaded to Carmen in PDF or Word format. PDF scans of handwritten pages are acceptable. Put your name and the homework assignment number at the top of the first page. Number all pages consecutively. Submit the problems in order.

Quizzes will focus on the material covered in the most recent homework assignment.

The final will cover all the material for the course.

Late assignments

Assignments will be due at the time posted on Carmen. With few exceptions, late assignments will not be accepted.

Grading scale

Final grades will be assigned based on performance in the course. The grades will not be lower than those in the “straight scale” of 90% for an A, 80% for a B, 70% for a C and so on. Appropriate adjustments to these cutoffs will be made to account for the difficulty of the quiz and exam questions.

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 **7-10 days**.

E-mail

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

Attendance, participation, and discussions

The class is designed around the lectures. Attendance is strongly encouraged as is class participation. If you have questions, ask in class or see me during office hours.

If you are unable to attend due to COVID-19 or for other reasons, let me know. If you test positive for the virus or believe that you have symptoms, it is best that you take care of health concerns before worrying about this class. Let me know of the situation promptly and we will make special arrangements.

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.

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The university has training (Together as Buckeyes and the Buckeye Pledge) that is intended to keep all of us safe.

- Remember to complete your daily health check and remember to self-isolate if you are running a fever or are symptomatic
- Remember to observe university expectations on mask wearing and social distancing in classrooms and elsewhere on campus
- In the event of non-compliance with university-sanctioned procedures (e.g., not wearing a mask or not social distancing), you may be asked to leave the class

Potential disruptions to instruction

- As much as possible, students will have access to material online if they are unable to attend class because of positive diagnosis, symptoms, or quarantine required following contact tracing.
- If the instructor is unable to be present in person because of positive diagnosis, symptoms, or quarantine following contact tracing a new instructor will be assigned to the course. Details will be given on the course website.

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 final exams:** You must complete the quizzes and final exam yourself, without any external help or communication.
- **Written homework assignments:** You are encouraged to work with fellow students on the homework, but do not copy any part of a homework. Each student must produce his/her own homework to be handed in.

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 at 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; 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 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)

		JANUARY 2021					
		SUBJECT <u>Stat 6802</u> PERIOD <u>8:50-10:05</u>					
		MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT/SUN
WEEK						1	2/3
	notes						
WEEK		4	5	6	7	8	9/10
	notes						
WEEK 1		11 1. Review of sufficiency and minimal sufficiency	12	13 2. Review of sufficient, ancillary, and complete statistics	14	15 3. Review of Basu's theorem	16/17
	notes	6: 1, 2		6: 2		6: 2	
WEEK 2		18 No class	19	20 4. Point estimation. Method of moments. Maximum likelihood.	21	22 5. - HW 1 due Maximum likelihood. Finding MLEs.	23/24
	notes			7: 1, 2		7: 2	
WEEK 3		25 6. Maximum likelihood. Finding MLEs. Invariance.	26 Quiz 1	27 7. Bayes estimators.	28	29 8. - HW 2 due Eval. estimators. MSE. Unbiasedness.	30//31
	notes	7: 2		7: 3		7: 3	

FEBRUARY 2021

 SUBJECT Stat 6802 PERIOD 8:50-10:05

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT/SUN
WEEK 4	1 9. Eval. estimators. Best unbiased est.	2 Quiz 2	3 10. Eval. estimators. Cramér-Rao. Fisher information.	4	5 11. - HW 3 due Eval. estimators. Suff. and unbiased. Rao-Blackwell.	6/7
WEEK 5	8 12. Eval. estimators. Properties of UMVUEs.	9 Quiz 3	10 13. Eval. estimators. Completeness.	11	12 14. - HW 4 due Consistency.	13/14
WEEK 6	15 15. Efficiency.	16 Quiz 4	17 16. Decision theory. Introduction.	18	19 17. Decision theory. Basic concepts and definitions.	20/21
WEEK 7	22 18. Decision theory. Decision principles.	23	24 No class	25	26 19. - HW 5 due Decision theory. Bayes rules. Admissibility.	27/28

MARCH 2021

 SUBJECT Stat 6802 PERIOD 8:50-10:05

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT/SUN
WEEK 8	1 20. Decision theory. Complete classes. Generalized Bayes rules.	2 Quiz 5	3 21. Hyp. testing. Def's. LRT (decision theory motivation)	4	5 22. - HW 6 due Hyp. testing. LRT examples. LRT and sufficiency.	6/7
notes	Various		8: 1, 2. Various		8: 2	
WEEK 9	8 23. Hyp. testing. LRT & nuisance param's. Bayesian tests.	9 Quiz 6	10 24. Hyp. testing. Power function.	11	12 25. - HW 7 due Hyp. testing. Normal samples examples.	13/14
notes	8: 2		8: 3		8: 3	
WEEK 10	15 26. Hyp. testing. p-values. Fisher's exact test.	16 Quiz 7	17 27. Hyp. testing. Most powerful tests. Neyman-Pearson lemma.	18	19 28. - HW 8 due Hyp. testing. UMP tests: examples and discussion. Bayes tests	20/21
notes	8: 3		8: 3		Various	
WEEK 11	22 29. Hyp. testing. Hybrid classical/ Bayesian. MLR. Karlin-Rubin Thm.	23 Quiz 8	24 30. Hyp. testing. Ex's of existence and non-existence of UMP tests.	25	26 31. Hyp. testing. UMP unbiased tests. Generalized N-P lemma.	27/28
notes	8: 3. Various		8: 3		8: 3. Various	
WEEK 12	29 32. Hyp. testing. UMP unbiased tests. Generalized N-P lemma.	30	31 No class			
notes	8: 3. Various					

APRIL 2021

 SUBJECT Stat 6802 PERIOD 8:50-10:05

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT/SUN
WEEK 12				1	2 33. - HW 9 due Hyp. testing. Philosophical distinctions.	3/4
notes					Various	
WEEK 13	5 34. Large sample tests. LRT, Wald tests.	6 Quiz 9	7 35. Large sample tests. Score tests. Interval estimation. Introduction.	8	9 36. - HW 10 due Interval estimation. Coverage prob. Construction by inversion.	10/11
notes	10: 3.		10: 3. 9: 1		9: 1, 2	
WEEK 14	12 37. Interval estimation. Construction by inversion. Pivoting.	13 Quiz 10	14 38. Interval estimation. Pivoting ex's. Bayesian intervals	15	16 39. - HW 11 due Interval estimation. Evaluation of est's.	17/18
notes	9: 2		9: 2		9: 3	
WEEK 15	19 40. Test related optimality. Approx. intervals.	20 Quiz 11	21 41. Approx. intervals. Prediction intervals. Tolerance intervals.	22	23 42. Rank-based hypothesis testing.	24/25
notes	9: 3. 10: 4		10: 4. 11: 3		Various	
WEEK	26 HW 12 due	27	28 Final exam	29	30	
notes						