

Term Information

Effective Term Autumn 2020

General Information

Course Bulletin Listing/Subject Area Statistics
Fiscal Unit/Academic Org Statistics - D0694
College/Academic Group Arts and Sciences
Level/Career Undergraduate
Course Number/Catalog 2450.02
Course Title Introduction to Statistical Analysis I
Transcript Abbreviation Intro Stat Anl 1
Course Description Calculus-based introduction to statistical data analysis. Includes sampling, experimental design, probability, binomial and normal distributions, sampling distributions, inference, regression, ANOVA, two-way tables. Offered online.
Semester Credit Hours/Units Fixed: 3

Offering Information

Length Of Course 14 Week, 12 Week, 8 Week, 7 Week, 6 Week
Flexibly Scheduled Course Never
Does any section of this course have a distance education component? Yes
Is any section of the course offered 100% at a distance
Grading Basis Letter Grade
Repeatable No
Course Components Recitation, Lecture
Grade Roster Component Recitation
Credit Available by Exam No
Admission Condition Course No
Off Campus Never
Campus of Offering Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites Prereq: Math 1131, 1141, 1151, 1156, 1161.xx, or 1181H, or equiv, or permission of instructor.
Exclusions Not open to students with credit for 2450, 2450.01, 2480, 2480.01, and 2480.02
Electronically Enforced Yes

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code 27.0501
Subsidy Level Baccalaureate Course
Intended Rank Freshman, Sophomore, Junior, Senior

Requirement/Elective Designation

General Education course:
Data Analysis

Course Details

Course goals or learning objectives/outcomes

- Students understand basic concepts of statistics and probability.
- Students comprehend methods needed to analyze and critically evaluate statistical arguments.
- Students recognize the importance of statistical ideas.

Content Topic List

- Sampling and experimental design
 - Tables and graphical displays for summarizing categorical and quantitative variables
 - Numerical summaries for quantitative variables
 - Probability, including basic rules and counting techniques
 - Random variables – distributions, mean, variance
 - Binomial distribution
 - Normal distribution
 - Sampling distributions
 - Confidence intervals and hypothesis testing for a single mean
 - Confidence intervals and hypothesis testing for a single proportion
 - One-way ANOVA
 - Correlation and linear regression
 - Inference for two-way tables
 - Confidence intervals and hypothesis testing based on two samples (time allowing)
- No

Sought Concurrence

Attachments

- STAT 2450.02 Syllabus (AU20) (Online.v2).docx
(Syllabus. Owner: Craigmile, Peter F)
- Stat 2450.01_outcomes_assessment.doc
(GEC Course Assessment Plan. Owner: Craigmile, Peter F)
- STAT 2450.02_DL.docx: DL checklist (edits are made)
(Other Supporting Documentation. Owner: Craigmile, Peter F)

Comments

COURSE REQUEST
2450.02 - Status: PENDING

Last Updated: Vankeerbergen, Bernadette
Chantal
07/01/2020

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Craigmile, Peter F	06/19/2020 08:47 AM	Submitted for Approval
Approved	Craigmile, Peter F	06/19/2020 08:49 AM	Unit Approval
Approved	Haddad, Deborah Moore	06/19/2020 08:54 AM	College Approval
Pending Approval	Jenkins, Mary Ellen Bigler Hanlin, Deborah Kay Oldroyd, Shelby Quinn Vankeerbergen, Bernadette Chantal	06/19/2020 08:54 AM	ASCCAO Approval



THE OHIO STATE UNIVERSITY

STATISTICS: 2450 INTRODUCTION TO STATISTICAL ANALYSIS I AUTUMN 2020

Course overview

Office Hours for Course Coordinator & Instructor

Jonathan Baker

baker.375@osu.edu

614-247-2757

Students may reach my online virtual hours via this CarmenZoom link: go.osu.edu/jbus

Teaching Assistant (to be completed by student)

Contact Information for other Students and/or Instructors

Meeting Days/Times

This course will be offered completely online.

Lectures will occur synchronously via CarmenZoom during scheduled class times. Please inform both your TA & Dr. Baker if this poses any difficulty. Lecture recordings will be available the following morning. Students will not be adversely penalized for extenuating circumstances which might impact consistent attendance (e.g., having limited Internet access, significant time zone differential, etc...).

You are assigned to a recitation section. Each week, a recitation activity will be posted on Carmen. This will be accompanied by live CarmenZoom interactions, tutorial videos, worked out examples or other educational materials.

Course description

Calculus-based introduction to statistical data analysis. Includes sampling, experimental design, probability, binomial and normal distributions, sampling distributions, inference, regression, ANOVA, two-way tables. The prerequisite for this 3 credit hour course is differential calculus.

Your Support System

Lecturer	Provide the overarching view of the clusters of concepts.
Recitations	Reinforce and extend content covered in lecture. Students will attend online recitations synchronously in alignment with their scheduled times on Fridays. Recitation assignments must be submitted via Carmen DropBox prior to the next lecture. Students should still expect to be active participants in these sessions.
Tutor Hours	Students will connect can review mslc.osu.edu for the most recent info.

Primary Course Goal:

- To develop skills in drawing conclusions & critically evaluating results based on data.

Course learning outcomes

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

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

Course Objectives:

- To enable you to use statistical tools for presentation and descriptions of data
- To enable you to correctly apply probability rules and counting techniques.
- To enable you to understand the use of sampling distributions as the foundation of inference.
- To enable you to analyze data through linear regression, confidence intervals, and hypothesis tests.
- To enable you to use your knowledge of calculus to conceptually understand its role in computing probabilities.

GE Course Information:

- Quantitative & Logical Analysis Category {Data Analysis Sub-category}

- Develop students' quantitative literacy and logical reasoning.
- Identify valid arguments
- Use mathematical models
- Draw conclusions & critically evaluate results based upon data.

Dr. Baker's vision for your completion of STAT 2450

- You will become proficient in collecting, organizing, analyzing, and interpreting data
- You will become competent in the use of data analysis software.
- You will conceptually understand situations involving random phenomena.
- You will interpret findings and improve your ability to justify your results.
- Your metacognition & desire to reflect upon what you have learned will be heightened.
- You will respond to a problem by: considering any relevant assumptions, analyzing, and effectively communicating your results.
- You will gain a greater appreciation for statistics (and the underpinning mathematics).
- You will complete the Data Analysis GE requirement.

Personal Vision Statement & Commitment

Personal <u>Vision Statement</u> for STAT 2450:	Personal <u>Commitment</u> to STAT 2450:
By successfully completing STAT 2450 I will:	To successfully complete STAT 2450, I must:
<ul style="list-style-type: none"> • • • 	<ul style="list-style-type: none"> • • •

Course Materials

Required Materials

- *Introductory Statistics: A Problem-Solving Approach (3rd ed.)* Kokoska.
ISBN 9781319272685

This course requires electronic access to the accompanying web-based materials via *Sapling*. The ebook, quizzes, and homework assignments are all located within this resource.

The cost is \$67.49 through CarmenBooks.

STUDENT REGISTRATION INSTRUCTIONS

The following link includes more detailed instructions on how to register for your course:
<https://macmillan.force.com/macmillanlearning/s/article/Students-Register-for-Sapling-Learning-courses-via-your-school-s-LMS>

- Log into STAT 2450 through Carmen.
- Click the MacMillan App in the left navigation panel.
- Click the Sapling Learning link (note: if you encounter an error message or blank screen, you will need to adjust your browser settings and/or disable pop-up blockers).
- Agree to Macmillan Learning terms of use and end user agreement.
- Select your access option (credit card payment, use an activation code, or, request trial access). Click on any Sapling assignment link to launch the assignment.
- Follow the associated steps and continue to your assignment page.
- You are now enrolled in the course and can access future assignments through the links on your instructor's course page.
- To access your ebook click on the image of the cover on the right sidebar of your course site. Create an account or login with an existing Macmillan Learning ebook account.

(MacMillan privacy notice: <https://store.macmillanlearning.com/us/privacy-notice>)

Top Hat

We will use the *Top Hat* software to elicit student responses during lectures. Students will use their smart phones to text responses to questions posed. Please use the following information and the Student Quick Start Guide that is posted on Carmen to complete the registration process. Your username must be name.# (e.g. obama.3).

Top Hat course name: **STAT 2450 AU 2020**

(Top Hat privacy policy: <https://tophat.com/company/legal/privacy-policy/>)

(Very) Highly recommended materials

Texas Instruments 83 Plus (or higher) Graphing Calculator.

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>, & 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

- CarmenConnect text, audio, and video chat
- 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 7+) 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>.

Grading

Grades

Assignment or category	Percentage	Your Grade
Exam 1 (<u>Wednesday</u> , October 7 th)	20%	
Exam 2 (<u>Wednesday</u> , November 18 th)	20%	
Final Exam (Administered Remotely)	30%	
Homework Assignments (7 total, 1.43% each, none are dropped)	10%	
Quizzes (7 total, 1.67% each, 1 is dropped)	10%	
Attendance & Participation (Combined For Lecture & Recitation)	10%	
Total	100	

The exact due dates will appear in the daily calendar at the end of this document.

Homework assignments are completed in our learning management system, Sapling Plus. They'll be generally due on Fridays – quizzes due on Mondays. Exams will have two primary components. The conceptual part will be administered in Carmen via "Secure Exam Proctor." The other component is more applied in nature and will be submitted by the appropriate date as part of an overall course project.

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

Additional Policies, Resources, & Information

Instructor feedback and response time

Grading and feedback

Midterm examinations will be available within **2 recitations**.

E-mail

All course e-mail correspondence must be done through a valid OSU name.n account.

Expect a 24-hour response time when communicating with TAs and lecturers.

We are here to support you, but just not quite in a true “on-demand” sense.

Discussion board

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

Student participation and responsibility

We expect you to be actively engaged in the learning process. You are responsible for your learning. Schedule a minimum of 6 hours to prepare for this course. This equates to 9 hours weekly when the 3 hours for lecture and recitation attendance are included. Successful students perform a variety of positive academic behaviors like: reviewing the Carmen page, downloading notes, being proactive in contacting a TA or classmate as necessary, etc.. Please seek assistance in managing any non-academic responsibilities prior to any potential for under-performance.

Successful students perform a variety of positive academic behaviors like: reviewing the Carmen twice a week, reviewing the weekly learning units the first half of each week, and completing all homework assignments and quizzes during the second half of each week.

Student participation requirements

Because this is a distance-education course, your attendance is based on your online activity and participation. Lectures will occur synchronously during scheduled class times. Please inform both your TA & Dr. Baker if this poses any difficulty. Lecture recordings will be available the following morning. 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: REQUIRED**
Attending at least 1 virtual office hour each week is required. The TAs and I will provide an array of times to accommodate you. To receive credit virtually, you must log in AND participate in the discussion.
- **Participating in discussion forums: 2+ TIMES PER WEEK**
You are expected to post your own response to each topic, and to respond to at least one classmate's response. Each week will feature one or two 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 remember that this is a university course, and not a casual dialogue occurring via a cellular phone.

- **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 proper grammar, spelling, and punctuation. Be selective in the usage of emoticons.
- **Tone and civility:** Maintaining a supportive learning community is critical. Everyone must feel safe and comfortable expressing their opinions. Attempt to obtain clarification with an individual (including myself) privately and respectfully.
- **Citing your sources:** Please include the exact page number (of the textbook or notes) and/or exercise when requesting assistance. For online sources, use links and reference the last time the link was accessed.
- **Saving your work:** Consider composing your academic posts in a word processor, where you can save your work, and then copying into the Carmen discussion.

Electronic devices

As a courtesy to fellow classmates, all cellular phones and other electronic devices must be silenced during lectures and recitations. Your engagement with the class will require an attentiveness for note-taking. If necessary, TAs and lecturers can request that students place these devices out of plain view if their usage is deemed irrelevant to instruction.

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

A guiding principle is that, if you are considering doing something that might be unethical, then **"Don't do it!!"** This mantra applies to both academic and non-academic settings.

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/>.

The Ohio State University’s *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: “Any activity that tends to compromise the academic integrity of the University, or subvert the educational process.” Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University’s *Code of Student Conduct* is never considered an “excuse” for academic misconduct, so I recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct. <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. In short, if you are considering doing something that might be unethical, then resist and refrain from pursuing it. This will help you in college and well-beyond.

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:

- The Committee on Academic Misconduct web pages ([COAM Home](#))
- *Ten Suggestions for Preserving Academic Integrity* ([Ten Suggestions](#))
- *Eight Cardinal Rules of Academic Integrity* (www.northwestern.edu/uacc/8cards.htm)

Policies for this online course

- **Homework, Quizzes, and exams:** Homework & quizzes will be completed in our Learning Management system, Sapling Plus. *Exams will have two primary components. One part administered via “Secure Exam Proctor.” The other component submitted by the appropriate date as part of an overall course project.*

- **Recitations:** Students will attend online recitations synchronously in alignment with their scheduled times on Fridays. Recitation assignments must be submitted via CarmenDropBox prior to the next lecture (usually by 1:49p on Mondays).
- **Written assignments:** Your written assignments, including discussion posts, should be your own original work. In formal assignments, you should follow **[MLA/APA/?]** style to 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.
- **Group projects:** This course includes group projects, which can be stressful for students when it comes to dividing work, taking credit, and receiving grades and feedback. I will make the guidelines for group work as clear as possible for each activity and assignment, but please let me know if you have any questions.

Grade Appeals

Your TAs are highly capable and follow established rubrics in evaluating your work. Only in the rarest of cases will an exam grade need to be appealed. In these situations:

- a) (within 1 week of receipt of your assessment) Inform your TA of the issue in writing
- b) Attach a statement of the issue at-hand to your work and submit to Dr. Baker.

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.

Course Registration and Completion

Students will be able to work with department staff on any ADD and SECTION changes. Students can begin communicating with Jean Scott (Cockins Hall 408A), Tuesday, January 14th.

Date	Event
Friday, August 28 th	The last day to add the course without instructor permission.
Friday, September 4 th	The last day to register and avoid additional fees.
	<i>*Please note that students who are dropped for non-payment are not guaranteed re-enrollment.*</i>
Friday, September 18 th	The last day to drop without a 'W' appearing on your record.
Friday, October 23 rd	The last day to drop the course without petitioning.

FYI, Incompletes will only be awarded when 70% of the coursework has been completed.

Accommodations for accessibility

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.

Grade Appeals

Your TAs are highly capable and follow established rubrics in evaluating your work. Only in the rarest of cases will an exam grade need to be appealed. In these situations:

- (within 1 week of receipt of your assessment) Inform your TA of the issue in writing
- Attach a statement of the issue at-hand to your work and submit to Dr. Baker

Make-Up Mid-term Examinations

The established exam dates and times are a priority for both students and university officials. Valid and documented absences during exam dates require final pre-approval from Dr. Baker. In requesting a make-up exam you must communicate with both your TA and Dr. Baker. Your performance on the final exam items most associated with the missed exam will count as the missed exam grade with up to an additional 10% point deduction. If you miss an exam because of an emergency, contact Dr. Baker immediately to request a makeup exam. You'll need to provide evidence of need for rescheduling this exam.

Other Student Resources (Including: Mental Health, Relationship Violence & Diversity)

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](tel: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](tel: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.

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. Students can find information about academic services available at OSU on this website: <http://artsandsciences.osu.edu/current-students/university-resources>, and about general student services on this website: <http://ssc.osu.edu>.

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.

Students can find information about academic services available at OSU on this website: <http://artsandsciences.osu.edu/current-students/university-resources>, and about general student services on this website: <http://ssc.osu.edu>.

Lecture Schedule: Online Synchronously beginning at 1:50p on MW

<i>Mondays</i>	<i>Wednesdays</i>
August 24 No Lecture - Autumn Semester Eve	August 26 Chp.1 An Intro. to Statistics & Statistical Inference
August 31 2.1–2.3 Types of Data, Bar Charts, Pie Charts, Stem-and-Leaf Plots	September 2 <u>HW 1 Due F 9/4 Qz.1 Due Su 9/6</u> 2.4 Frequency Distributions and Histograms
September 7 No Lecture – Labor Day	September 9 3.1,3.2 Measures of Central Tendency & Variability
September 14 3.3 Empirical Rule, Measures of Position, Box Plots	September 16 <u>HW 2 Due F 9/18 Qz.2 Due Su 9/20</u> 4.1 Experiments, Sample Spaces, Events
September 21 4.2 An Introduction to Probability 4.3 Counting Techniques	September 23 4.4 Conditional Probability 4.5 Independence
September 28 5.4 The Binomial Distribution (with ref. to 5.1)	September 30 <u>HW 3 Due F 10/2 Qz.3 Due Su 10/4</u> 6.2 The Normal Distribution (with ref. to 6.1)
October 5 Short Exam Review 6.3 Checking the Normality Assumption 6.4 Exponential Distribution	October 7 Exam 1 (Chps. 1 – 4)
October 12 7.1 Statistics, Parameters & Sampling Distributions 7.2 Sampling Distribution of the Sample Mean	October 14 <u>HW 4 Due M 10/16 Qz.4 Due M 10/18</u> 7.3 Distribution of the Sample Proportion (Fall Break Eve)
October 19 8.1 Point Estimation	October 21 8.2 Conf. Int. for a Pop. Mean when σ is Known (z)
October 26 8.3 Conf.Int.for a Pop.Mean when σ is Unknown (t)	October 28 <u>HW 5 Due F 10/30 Qz.5 Due Su 11/1</u> 8.4 Confidence Interval for a Population Proportion
November 2 9.1, 9.2 Parts of a Hypothesis Tests & Errors	November 4 9.3 Hypothesis Tests for a Pop. Mean when σ is Known(z)
November 9 9.4 P-Values 9.5 Hypothesis for Pop. Mean w/ σ Unknown(t)	November 11 <u>HW 6 Due F 11/13 Qz.10 Due Su 11/15</u> No Lecture – Veterans Day
November 16 Short Exam Review 9.6 Hypothesis Tests for a Population Proportion	November 18 Exam 2 (Chps. 5 – 9)
November 23 11.1 One-Way ANOVA	November 25 No Lecture – Thanksgiving Break
November 30 12.1 Simple Linear Regression	December 2 <u>HW 7 Due F 12/4 Qz.11 Due Su 12/6</u> 12.2 Hypothesis Tests and Correlation
December 7 13.1 Univariate Categorical Data	December 9 Short Exam Review 13.2 Bivariate Categorical Data (Final Exam Administered Remotely)



THE OHIO STATE UNIVERSITY

STATISTICS: 2450 INTRODUCTION TO STATISTICAL ANALYSIS I AUTUMN 2020

Course overview

Office Hours for Course Coordinator & Instructor

Jonathan Baker
TBD

baker.375@osu.edu

614-247-2757

Teaching Assistant (to be completed by student)

Contact Information for other Students and/or Instructors

Meeting Days/Times

MW 1:50p – 2:45p Campbell (CM) 200 w/recitations F @ 11:30a, 12:40p, 1:50p or 3p in EA bldg.

Course description

Calculus-based introduction to statistical data analysis. Includes sampling, experimental design, probability, binomial and normal distributions, sampling distributions, inference, regression, ANOVA, two-way tables. The prerequisite for this 3 credit hour course is differential calculus.

Your Support System

Lecturer	Provide the overarching view of the clusters of concepts.
Recitations	Reinforce and extend content covered in lecture. Students should expect to be active participants in these sessions.
Tutor Hours	Are in Cockins (CH) 132 and provide you with additional support on a walk-in basis M- R 9:10a – 5:20p & Fridays 9:10a – 12:45p.

Primary Course Goal:

- To develop skills in drawing conclusions & critically evaluating results based on data.

Course learning outcomes

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

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

Course Objectives:

- To enable you to use statistical tools for presentation and descriptions of data
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Dr. Baker's vision for your completion of STAT 2450

- You will become proficient in collecting, organizing, analyzing, and interpreting data
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<p>By successfully completing STAT 2450 I will:</p> <ul style="list-style-type: none"> • • • 	<p>To successfully complete STAT 2450, I must:</p> <ul style="list-style-type: none"> • • •

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STUDENT REGISTRATION INSTRUCTIONS

The following link includes more detailed instructions on how to register for your course:
<https://macmillan.force.com/macmillanlearning/s/article/Students-Register-for-Sapling-Learning-courses-via-your-school-s-LMS>

- Log into STAT 2450 through Carmen.
- Click the MacMillan App in the left navigation panel.
- Click the Sapling Learning link (note: if you encounter an error message or blank screen, you will need to adjust your browser settings and/or disable pop-up blockers).
- Agree to Macmillan Learning terms of use and end user agreement.
- Select your access option (credit card payment, use an activation code, or, request trial access). Click on any Sapling assignment link to launch the assignment.
- Follow the associated steps and continue to your assignment page.
- You are now enrolled in the course and can access future assignments through the links on your instructor's course page.
- To access your ebook click on the image of the cover on the right sidebar of your course site. Create an account or login with an existing Macmillan Learning ebook account.

Top Hat

We will use the *Top Hat* software to elicit student responses during lectures. Students will use their smart phones to text responses to questions posed. Please use the following information and the Student Quick Start Guide that is posted on Carmen to complete the registration process. Your username must be name.# (e.g. obama.3).

Top Hat course name: **STAT 2450 AU 2020**

(Very) Highly recommended materials

Texas Instruments 83 Plus (or higher) Graphing Calculator.

Grading

Grades

Assignment or category	Percentage	Your Grade
Exam 1 (<u>Wednesday</u> , October 7 th)	20%	
Exam 2 (<u>Wednesday</u> , November 18 th)	20%	
Final Exam (Administered Remotely)	30%	
Homework Assignments (7 total, 1.43% each, none are dropped)	10%	
Quizzes (7 total, 1.67% each, 1 is dropped)	10%	
Attendance & Participation (Combined For Lecture & Recitation)	10%	
Total	100	

The exact due dates will appear in the daily calendar at the end of this document.

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

Additional Policies, Resources, & Information

Instructor feedback and response time

Grading and feedback

Midterm examinations will be available within **2 recitations**.

E-mail

All course e-mail correspondence must be done through a valid OSU name.n account. Expect a 24-hour response time when communicating with TAs and lecturers. We are here to support you, but just not quite in a true “on-demand” sense.

Student participation and responsibility

We expect you to be actively engaged in the learning process. You are responsible for your learning. Schedule a minimum of 6 hours to prepare for this course. This equates to 9 hours weekly when the 3 hours for lecture and recitation attendance are included. Successful students perform a variety of positive academic behaviors like: reviewing the Carmen page, downloading notes, being proactive in contacting a TA or classmate as necessary, etc.. Please seek assistance in managing any non-academic responsibilities prior to any potential for under-performance.

Successful students perform a variety of positive academic behaviors like: reviewing the Carmen twice a week, reviewing the weekly learning units the first half of each week, and completing all homework assignments and quizzes during the second half of each week.

Electronic devices

As a courtesy to fellow classmates, all cellular phones and other electronic devices must be silenced during lectures and recitations. Your engagement with the class will require an attentiveness for note-taking. If necessary, TAs and lecturers can request that students place these devices out of plain view if their usage is deemed irrelevant to instruction.

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

A guiding principle is that, if you are considering doing something that might be unethical, then **“Don’t do it!!”** This mantra applies to both academic and non-academic settings.

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/>.

The Ohio State University's *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the University, or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University's *Code of Student Conduct* is never considered an "excuse" for academic misconduct, so I recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct. <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. In short, if you are considering doing something that might be unethical, then resist and refrain from pursuing it. This will help you in college and well-beyond.

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:

- The Committee on Academic Misconduct web pages ([COAM Home](#))
- *Ten Suggestions for Preserving Academic Integrity* ([Ten Suggestions](#))
- *Eight Cardinal Rules of Academic Integrity* (www.northwestern.edu/uacc/8cards.htm)

Grade Appeals

Your TAs are highly capable and follow established rubrics in evaluating your work. Only in the rarest of cases will an exam grade need to be appealed. In these situations:

- a) (within 1 week of receipt of your assessment) Inform your TA of the issue in writing
- b) Attach a statement of the issue at-hand to your work and submit to Dr. Baker.

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.

Course Registration and Completion

Students will be able to work with department staff on any ADD and SECTION changes. Students can begin communicating with Jean Scott (Cockins Hall 408A), Tuesday, January 14th.

Date	Event
Friday, August 28 th	The last day to add the course without instructor permission.
Friday, September 4 th	The last day to register and avoid additional fees.
	<i>*Please note that students who are dropped for non-payment are not guaranteed re-enrollment.*</i>
Friday, September 18 th	The last day to drop without a 'W' appearing on your record.
Friday, October 23 rd	The last day to drop the course without petitioning.

FYI, Incompletes will only be awarded when 70% of the coursework has been completed.

Accommodations for accessibility

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.

Grade Appeals

Your TAs are highly capable and follow established rubrics in evaluating your work. Only in the rarest of cases will an exam grade need to be appealed. In these situations:

- a) (within 1 week of receipt of your assessment) Inform your TA of the issue in writing
- b) Attach a statement of the issue at-hand to your work and submit to Dr. Baker

Make-Up Mid-term Examinations

The established exam dates and times are a priority for both students and university officials. Valid and documented absences during exam dates require final pre-approval from Dr. Baker. In requesting a make-up exam you must communicate with both your TA and Dr. Baker. Your performance on the final exam items most associated with the missed exam will count as the missed exam grade with up to an additional 10% point deduction. If you miss an exam because of an emergency, contact Dr. Baker immediately to request a makeup exam. You'll need to provide evidence of need for rescheduling this exam.

Other Student Resources (Including: Mental Health, Relationship Violence & Diversity)

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](tel: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](tel: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.

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. Students can find information about academic services available at OSU on this website: <http://artsandsciences.osu.edu/current-students/university-resources>, and about general student services on this website: <http://ssc.osu.edu>.

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.

Students can find information about academic services available at OSU on this website: <http://artsandsciences.osu.edu/current-students/university-resources>, and about general student services on this website: <http://ssc.osu.edu>.

Autumn 2020 STAT 2450 Calendar

Lecture Schedule (Online Synchronously)

<i>Mondays</i>	<i>Wednesdays</i>
August 24 No Lecture - Autumn Semester Eve	August 26 Chp.1 An Intro. to Statistics & Statistical Inference
August 31 2.1–2.3 Types of Data, Bar Charts, Pie Charts, Stem-and-Leaf Plots	September 2 <u>HW 1 Due F 9/4</u> <u>Qz.1 Due Su 9/6</u> 2.4 Frequency Distributions and Histograms
September 7 No Lecture – Labor Day	September 9 3.1,3.2 Measures of Central Tendency & Variability
September 14 3.3 Empirical Rule, Measures of Position, Box Plots	September 16 <u>HW 2 Due F 9/18</u> <u>Qz.2 Due Su 9/20</u> 4.1 Experiments, Sample Spaces, Events
September 21 4.2 An Introduction to Probability 4.3 Counting Techniques	September 23 4.4 Conditional Probability 4.5 Independence
September 28 5.4 The Binomial Distribution (with ref. to 5.1)	September 30 <u>HW 3 Due F 10/2</u> <u>Qz.3 Due Su 10/4</u> 6.2 The Normal Distribution (with ref. to 6.1)
October 5 Short Exam Review 6.3 Checking the Normality Assumption 6.4 Exponential Distribution	October 7 Exam 1 (Chps. 1 – 4)
October 12 7.1 Statistics, Parameters & Sampling Distributions 7.2 Sampling Distribution of the Sample Mean	October 14 <u>HW 4 Due M 10/16</u> <u>Qz.4 Due M 10/18</u> 7.3 Distribution of the Sample Proportion (Fall Break Eve)

October 19 8.1 Point Estimation	October 21 8.2 Conf. Int. for a Pop. Mean when σ is Known (z)
October 26 8.3 Conf.Int.for a Pop.Mean when σ is Unknown (t)	October 28 <u>HW 5 Due F 10/30 Qz.5 Due Su 11/1</u> 8.4 Confidence Interval for a Population Proportion
November 2 9.1, 9.2 Parts of a Hypothesis Tests & Errors	November 4 9.3 Hypothesis Tests for a Pop. Mean when σ is Known(z)
November 9 9.4 P-Values 9.5 Hypothesis for a Pop. Mean when σ is Unknown(t)	November 11 <u>HW 6 Due F 11/13 Qz.10 Due Su 11/15</u> No Lecture – Veterans Day
November 16 Short Exam Review 9.6 Hypothesis Tests for a Population Proportion	November 18 Exam 2 (Chps. 5 – 9)
November 23 11.1 One-Way ANOVA	November 25 No Lecture – Thanksgiving Break
November 30 (Remote Lecture) 12.1 Simple Linear Regression	December 2 <u>HW 7 Due F 12/4 Qz.11 Due Su 12/6</u> 12.2 Hypothesis Tests and Correlation (Remote Lecture)
December 7 (Remote Lecture) 13.1 Univariate Categorical Data	December 9 Short Exam Review (Remote Lecture) 13.2 Bivariate Categorical Data (Final Exam Administered Remotely)

Learning outcomes and assessment plan for Statistics 2450.02: Introduction to Statistical Analysis I

Expected Learning Outcomes Data Analysis: Students develop skills in drawing conclusions and critically evaluating results based on data.

Expected Learning Outcomes:

1. Students understand basic concepts of statistics and probability.
2. Students comprehend methods needed to analyze and critically evaluate statistical arguments.
3. Students recognize the importance of statistical ideas.

1. How do the course objectives address the GE category expected learning outcomes?

Students in Statistics 2450 are expected to be able to identify an appropriate analysis for data collected in a study, carry out such an analysis, examine whether the assumptions behind the analysis are reasonable, and recognize the strengths or weaknesses of the study based on how the data were collected. Doing so requires understanding basic concepts in statistics and probability; the ability to create numerical and critique graphical summaries of data; understanding how the design of a study affects the conclusions that can be made; and the ability to carry out basic statistical analyses.

2. How do the readings assigned address the GE category expected learning outcomes?

Readings are from the textbook and cover all the topics listed in the course. See the discussion in the next item regarding how these topics will address the GE category expected learning outcomes.

3. How do the topics address the GE category expected learning outcomes?

Course topics include probability (thus introducing students to basic concepts in probability); sampling distributions and statistical inference (thus introducing students to basic concepts in statistics); graphical and numerical summaries of data, design of experiments and sampling designs, and statistical inference (thus helping students critically evaluate statistical arguments); and one-sample procedures, two-sample procedures, regression, ANOVA and two-way tables (thus providing students with tools to analyze data).

4. How do the written assignments address the GE category expected learning outcomes?

The written assignments will include problems (from the textbook) on material from all the course topics. The problems will serve to provide practice in creating numerical

displays; evaluating the quality of graphical displays, designing simple studies and assessing the quality of a design used in a study (both experimental and sampling designs); understanding the rules of probability including calculating probabilities in simple settings; understanding the notion of sampling distributions and calculating simple probabilities for sample means based on the sampling distributions; analyzing data in a variety of settings as well as checking the assumptions behind the analyses.

Course assessment plan:

1. Students will conduct analyses of data throughout the course on both homework assignments and exams. Students will be required to discuss and interpret the results and the limitations of their analysis in both cases (using “plain English”). This will require mastery of the expected learning outcomes and will provide an assessment of the extent to which the class appears to have mastered the expected learning outcomes.
2. Final exams will contain embedded questions that address the learning outcomes. Using the same, or very similar, questions each time the course is taught will provide a consistent evaluation over time. Embedded questions will not appear in copies of past final exams and their solutions that are posted for student use. The embedded questions will either come from or be modeled on the Assessment Resource Tools for Improving Statistical Thinking (ARTIST) available online at www.causeweb.org/research/. These are validated test questions and measurement tools to use in assessing statistical thinking.
3. A departmental committee will review the syllabus and direct assessment results regularly to make sure that it continues to address learning outcomes for the data analysis component of the GE.

GE Expected Learning Outcomes	Methods of Assessment *Direct methods are required. Additional indirect methods are encouraged.	Level of student achievement expected for the GE ELO. (for example, define percentage of students achieving a specified level on a scoring rubric)	What is the process that will be used to review the data and potentially change the course to improve student learning of GE ELOs?
ELO 1 Students understand basic concepts of statistics and probability.	Embedded exam questions	Our goal is for 80% of the students in the course to answer items correctly; we consider this to be above average performance and to demonstrate successful achievement of the ELO.	A departmental committee will review the syllabus and direct assessment results regularly to make sure that it continues to address learning outcomes for the data analysis component of the GE.
ELO 2 Students comprehend methods needed to analyze and critically evaluate statistical arguments.	Embedded exam questions	Our goal is for 80% of the students in the course to answer items correctly; we consider this to be above average performance and to demonstrate successful achievement of the ELO.	
ELO 3 Students recognize the importance of statistical ideas.	Embedded exam questions	Our goal is for 80% of the students in the course to answer items correctly; we consider this to be above average performance and to demonstrate successful achievement of the ELO.	

Arts and Sciences Distance Learning Course Component Technical Review Checklist

Course: Stats 2450.02

Instructor: Jonathan Baker

Summary: Introduction to Statistical Analysis I

Standard - Course Technology	Yes	Yes with Revisions	No	Feedback/ Recomm.
6.1 The tools used in the course support the learning objectives and competencies.	X			<ul style="list-style-type: none"> Office 365 Carmen TopHat MacMillan App
6.2 Course tools promote learner engagement and active learning.	X			<ul style="list-style-type: none"> Carmen Message Boards Zoom
6.3 Technologies required in the course are readily obtainable.	X			All are available for free via OSU site license
6.4 The course technologies are current.	X			All apps are updated regularly.
6.5 Links are provided to privacy policies for all external tools required in the course.		X		Include Top Hat and MacMillan App privacy policies
Standard - Learner Support				
7.1 The course instructions articulate or link to a clear description of the technical support offered and how to access it.	X			Links to 8HELP are provided
7.2 Course instructions articulate or link to the institution's accessibility policies and services.	X			A
7.3 Course instructions articulate or link to an explanation of how the institution's academic support services and resources can help learners succeed in the course and how learners can obtain them.	X			B
7.4 Course instructions articulate or link to an explanation of how the institution's student services and resources can help learners succeed and how learners can obtain them.	X			C
Standard – Accessibility and Usability				
8.1 Course navigation facilitates ease of use.	X			Recommend using the Carmen Distance Learning "Master Course" template developed by ODEE and available in the Canvas Commons to provide student-users with a consistent user experience in terms of navigation and access to course content.
8.2 Information is provided about the accessibility of all technologies required in the course.		X		Please include accessibility policy for TopHat and the Macmillan app
8.3 The course provides alternative means of access to course materials in formats that meet the needs of diverse learners.	X			
8.4 The course design facilitates readability	X			
8.5 Course multimedia facilitate ease of use.				All assignments and activities that use the Carmen LMS with embedded multimedia facilitates ease of use. All other multimedia resources facilitate ease of use by being available through a standard web browser

Reviewer Information

- Date reviewed: 6/19/20
- Reviewed by: Ian Anderson

Notes: Good to go!

^aThe following statement about disability services (recommended 16 point font):
Students with disabilities (including mental health, chronic or temporary medical conditions) that have been certified by the Office of Student Life Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office of Student Life Disability Services is located in 098 Baker Hall, 113 W. 12th Avenue; telephone 614- 292-3307, slds@osu.edu; slds.osu.edu.

^bAdd to the syllabus this link with an overview and contact information for the student academic services offered on the OSU main campus.
<http://advising.osu.edu/welcome.shtml>

^cAdd to the syllabus this link with an overview and contact information for student services offered on the OSU main campus. <http://ssc.osu.edu>. Also, consider including this link in the “Other Course Policies” section of the syllabus.