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	2480.02
Course Title	Statistics for the Life Sciences
Transcript Abbreviation	Stat for Life Sci
Course Description	Calculus-based introduction to the statistical analysis of biological data, including probability, common discrete and continuous distributions, experimental design, hypothesis testing, linear regression and correlation. 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	Laboratory, Lecture
Grade Roster Component	Lecture
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, 2450.02, 2480 or 2480.01.
Electronically Enforced	No

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

The course is an elective (for this or other units) or is a service course for other units

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

- Concepts in probability (probability rules, conditional probability, independent events)
- Bayes' Theorem
- Random variables, probability distributions, probability density functions
- Common discrete and continuous random variables
- Sampling distributions, Central Limit Theorem
- Analysis of categorical data
- Estimation, confidence intervals
- Hypothesis testing
- Experimental design
- Linear regression and correlation

Sought Concurrence

No

Attachments

- STAT2480_DL_Syllabus.docx

  (Syllabus. Owner: Craigmile,Peter F)

- 2480.02 GE Assessment.docx

  (GEC Course Assessment Plan. Owner: Craigmile,Peter F)

- Stat 2480_DL.docx: DL checklist (edits made)

  (Other Supporting Documentation. Owner: Craigmile,Peter F)

Comments

- Note: R is open source software and does not have a privacy statement. *(by Craigmile,Peter F on 06/19/2020 08:37 AM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Craigmile,Peter F	06/19/2020 08:37 AM	Submitted for Approval
Approved	Craigmile,Peter F	06/19/2020 08:40 AM	Unit Approval
Approved	Haddad,Deborah Moore	06/19/2020 08:43 AM	College Approval
Pending Approval	Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Oldroyd,Shelby Quinn Vankeerbergen,Bernadette Chantal	06/19/2020 08:43 AM	ASCCAO Approval

THE OHIO STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

SYLLABUS: STAT 2480
STATISTICS FOR THE LIFE SCIENCES
FALL 2020

Course overview:

An introduction to statistical methods commonly used in the life sciences

Instructor

Instructor:
Email address:
Phone number:
Office hours:
Office Location:

Course Coordinator

Dr. Kubatko, kubatko.2@osu.edu

Course description

Statistical methods play an important role in the analysis of data collected in the biological sciences. This course will provide an introduction to the analysis of biological data in a statistical framework. The topics covered include the definition of probability and manipulation of probabilistic quantities; the common discrete and continuous distributions used in modeling biological phenomena; experimental design; and statistical methods for testing hypotheses.

Course learning outcomes

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

- Understand and discuss methods of collecting data

– By providing examples of methods of random sampling
– By explaining correct procedures for designing experiments and observational studies
– By explaining uses and misuses of sample surveys

- Use statistical tools for presentation of data and to understand presentations of data

  – By discussing when different types of graphical displays are appropriate and explaining proper methods of constructing graphical displays
  – By using appropriate summary statistics to describe the distribution of data
  – By introducing statistical terminology used to describe data and distributions

- Analyze data

  – By constructing and interpreting confidence intervals
  – By conducting and interpreting hypothesis tests
  – By using simple linear regression for bivariate data

- Understand basic probability and statistical concepts

  – By presenting and applying rules of probability
  – By study of the common discrete and continuous distribution used to model biological data
  – By discussing sampling distributions and the use of the Central Limit Theorem as the foundation of inference

- Evaluate statistical procedures and summaries

  – By discussing assumptions and conditions for analysis procedures
  – By identifying sources of bias in sampling, experiment, and survey methods
  – By discussing appropriate nature and scope of conclusions for analysis procedures
  – By discussing case studies in the life sciences

GE Course Information

- This course satisfies the GEC Data Analysis requirement
- The expected learning outcomes are:
  - ELO1: Students understand basic concepts of statistics and probability.
  - ELO2: Students comprehend methods needed to analyze and critically evaluate statistical arguments.
  - ELO3: Students recognize the importance of statistical ideas.
- These goals will be achieved by detailed study utilizing example data from the life sciences.

Course materials

Required

- Textbook: *The Analysis of Biological Data*, by M. C. Whitlock and D. Schluter, 3rd ed., ISBN: 9781319226299. The electronic version of this textbook and the accompanying homework management system **Sapling** are offered through CarmenBooks. https://affordablelearning.osu.edu/carmenbooks/students
- Need help with the textbook? The publisher's technical support team can be reached by phone, chat, or by email via the Student Support Community. To contact support please open a service request by filling out the webform at https://macmillan.force.com/macmillanlearning/s/contactsupport (Privacy notice: https://store.macmillanlearning.com/us/privacy-notice)

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; the following website may help you if you encounter difficulties with Carmen: https://resourcecenter.odee.osu.edu/canvas/ .

Necessary equipment

- Computer: current Mac (OS X) or PC (Windows 7+) with high-speed internet connection OR tablet with web-browser capabilities and high-speed internet connection
- CarmenZoom text, audio, and video chat. If you need technical assistance, either call 614-688-HELP, or refer to the online instructions: https://resourcecenter.odee.osu.edu/carmenzoom

Necessary software

- No additional software is required beyond a web-browser; students will be given instructions for using the open source R statistical software at the Ohio Supercomputer Center through their web browser. This software will be accessible on either a laptop or a tablet.

Online Course Delivery

Each week several lecture videos, totaling approximately 1.5 hours of lecture, will be posted on the course website. You are responsible for watching the videos and studying the material that is assigned each week. In addition to the lecture videos, weekly assignments will be posted on the class website. You will be given ample time to complete the assignments.

The instructor may elect to deliver live Zoom lectures in place of videos for certain topics. In this case, the lecture will be recorded and posted on the class website soon after.

The instructor will hold weekly office hours via Zoom. The dates and times will be announced later and posted on the Carmen website. The instructor will also initiate and manage active discussion boards, also via Carmen.

Each week, a laboratory activity using the R statistical software will be posted on Carmen. The laboratory activities will typically be accompanied by live Zoom interactions, tutorial videos, and other educational materials.

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. Live Zoom meetings will also regularly take place. The dates and times of these will be announced later (see the **Staff Response** section below).

Grading and faculty response

Grades

Assignment or category	Percentage
Homework	**15%**
Lab assignments	**10%**
Discussion board posts	**10%**
Exam #1	**20%**
Exam #2	**20%**
Final exam	**25%**
Total	**100**

See course schedule, below, for due dates

Assignment information

Homework: Required homework problems will be assigned for each topic covered in the course, and solutions will be submitted and graded via carmen. Recommended problems will also be posted for additional practice, but will not be collected or graded. You need to work through homework problems on your own in a timely manner in order to perform well in the class. Homework is worth 15% of your overall grade.

Labs: Lab exercises using the R software will be carried out once per week in place of a formal lecture. These lab exercises will be submitted via carmen quizzes, and will together account for 10% of the overall grade.

Discussion board posts: At two points during the semester, you will be required to post something on the class discussion board that shows an improper use of statistics. This could be a graph, statistical hypothesis test, discussion of data, etc., that you find in a news article, blog post, or twitter thread, for example. Each post should be accompanied by a couple of sentences describing what is incorrect. You will also be required to comment on at least two of the other students' posts, to either agree, point out an additional problem, or argue that the posted information is actually correct. Your first post and set of comments should be completed before the first exam, and your second should be completed before the end of the semester. Each post and set of comments is worth 5% of your grade.

Exams: There will be two midterms exams and a final exam. Statistical tables will be provided as needed. Please note the dates of all exams as given on the syllabus (below). All exams will be administered through the carmen course management system.

Formulas for use on the exams: Formula sheets will be provided for all exams. The formulas sheets will be made available prior to the exams to assist in exam preparation.

Makeup exams: If you absolutely need a makeup exam and have a valid excuse, please see your instructor for the necessary arrangements. However, you must notify the instructor in advance in such a situation. A make-up exam should be taken within a week of the missed exam. Exceptions to this policy will be permitted only in extreme situations such as serious injury immediately prior to an exam or severe illness requiring hospitalization.

Full credit on short answer exam problems: You need to show justification for your work on each short answer exam problem. Answers without work will not receive full credit.

Late assignments

Late assignments are not accepted without prior permission from the instructor.

Grading scale

93–100: A
90–92.9999: A-
87–89.9999: B+
83–86.9999: B
80–82.9999: B-
77–79.9999: C+
73–76.9999: C
70 –72.9999: C-
67 –69.9999: D+
60 –66.9999: D
Below 60: E

Staff feedback and response time

We are providing the following list to give you an idea of our intended availability throughout the course. (Remember that you can call **614-688-HELP** at any time if you have a technical problem.)

Canvas Conversations

A course instructor or teaching assistant will reply to messages sent via Canvas Conversations within **24 hours on school days (Monday – Friday, excluding university holidays; list of holidays at** http://registrar.osu.edu/staff/bigcal.asp**).**

Discussion board

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

Live Zoom office hours.

Each week, there will be live Zoom office hours. The dates and times of these will be communicated clearly and well in advance. An announcement will also be posted on the class website.

If you have questions about the Mastery Assessments (Quizzes, Exams, etc.) or notice any typos in the material, please message us directly via Canvas Conversations – please do not use the Discussion board.

Attendance, participation, and discussions

Communication guidelines

The following are our expectations for how we should communicate. Above all, please remember to be respectful and thoughtful.

- **Writing style**: While there is no need to communicate 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.
- **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

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

- **Assessments**: You must complete the exams yourself, without any external help or communication. Homework may be discussed with classmates or TAs, but submitted homework assignments should represent your own efforts.
- **Lab activities** can be completed in a “group setting” by collaborating with other students in the class. Help from sources outside of this class is not allowed.

Ohio State's academic integrity policy

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentlife.osu.edu/csc/.

Copyright disclaimer

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Statement on title IX (Recommended)

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at http://titleix.osu.edu or by contacting the Ohio State Title IX Coordinator, 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

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

Course schedule (tentative)

Class No.	Date	Topics	Reading
1	8/26/20	Introduction, methods for summarizing data	Ch. 1 - 3
2	8/28/20	Lab: Intro to the R software	
3	8/31/20	Probability	5.1 - 5.3
4	9/2/20	Probability	5.5 - 5.6
5	9/4/20	Lab: Exploratory data analysis in R	
No class	9/7/20	**Labor Day Holiday**	

6	9/9/20	Conditional probability	5.7
7	9/11/20	Lab: Random sampling activity	
8	9/14/20	Law of total probability, Bayes Theorem	5.8 - 5.9
9	9/16/20	Random variables	5.4
10	9/18/20	Lab: Statistical distributions in R	
11	9/21/20	Hypothesis testing, Binomial test	Ch. 6, 7.2
12	9/23/20	Goodness-of-fit tests	8.2 - 8.5
13	9/25/20	Lab: Hypothesis tests in R -- part 1	
14	9/28/20	Poisson distribution	8.6
15	9/30/20	**Exam #1**	Ch. 1-8
16	10/2/20	Lab: Hypothesis tests in R -- part 2	
17	10/5/20	Analyzing proportions, odds ratios	9.1 - 9.3
18	10/7/20	Contingency tables	9.4
19	10/9/20	Lab: Contingency tables in R	
20	10/12/20	Normal distribution	10.1 - 10.4
21	10/14/20	Central limit theorem	10.5 - 10.6
No class	10/16/20	**FALL BREAK**	
22	10/19/20	t distribution and confidence intervals	11.1 - 11.2
23	10/21/20	One-sample t-test	11.3 - 11.4
24	10/23/20	Lab: Normal probability plots, t distribution	Chapter 13
25	10/26/20	Comparing two means, paired test	12.1 - 12.2
26	10/28/20	Comparing two means, unpaired test	12.3 - 12.7
27	10/30/20	Lab: Inference for the population mean in R	
28	11/2/20	**Exam #2**	Ch. 9 - 12
29	11/4/20	Experimental and observational studies	Ch. 14
30	11/6/20	Lab: Power of hypothesis tests, NP tests	

31	11/9/20	ANOVA	15.1 - 15.2
No class	11/11/20	**Veteran's Day**	
32	11/13/20	Lab: ANOVA in R -- part 1	
33	11/16/20	ANOVA	15.3 - 15.4
34	11/18/20	Case study	
35	11/20/20	Lab: ANOVA in R -- part 2	
36	11/23/20	Correlation	Ch. 16
No class	11/25/20	**Thanksgiving Break**	
No class	11/27/20	**Thanksgiving Break**	
37	11/30/20	Regression	17.1 - 17.2
38	12/2/20	Regression	17.3 - 17.5
39	12/4/20	Lab: Regression in R	
40	12/7/20	Logistic regression	17.6 - 17.9
41	12/9/20	Course Summary & Review	All material

Final Exam: TBD

Syllabus for Stat 2480.01: Statistics for the Life Sciences

Instructor:
Office:
Office Hours:
E-mail:

Course meeting times and locations:

Required Text: The Analysis of Biological Data, by M. C. Whitlock and D. Schluter, 2^{nd} edition, customized for OSU, published by Bedford/Freeman/Worth. The online text can be purchased here: `https://www.vitalsource.com/custom/9781319147785`.

Software: We will use the R Statistical Software environment for this course. This software will be run via RStudio using the OnDemand services offered by the Ohio Supercomputer Center (`http://www.osc.edu`). The R software is also available in most computer labs on campus, and is free software that you can download and install on your personal machines as well (`http://www.r-project.org/`). Our Friday meetings will be devoted to class activities using R, and you will gain experience with R during these activities. However, **you should also expect to put in time outside of class doing data analysis with R.**

Website: Please visit `http://www.carmen.osu.edu/`. Carmen is used extensively for this course, so you should check daily for announcements about the class and other class material.

Course Description: Statistical methods play an important role in the analysis of data collected in the biological sciences. This course will provide an introduction to the analysis of biological data in a statistical framework. The topics covered include the definition of probability and manipulation of probabilistic quantities; the common discrete and continuous distributions used in modeling biological phenomena; experimental design; and statistical methods for testing hypotheses.

Course Goals: This course satisfies the learning goals of the GEC Data Analysis requirement. In particular, in Statistics 2480 students are expected to understand statistics and probability, comprehend mathematical methods needed to analyze statistical arguments, and recognize the importance of statistical ideas. These goals will be achieved by detailed study utilizing example data from the life sciences.

Course Objectives:

- To introduce you to methods of collecting data
  - By providing examples of methods of random sampling
  - By explaining correct procedures for designing experiments and observational studies
  - By explaining uses and misuses of sample surveys
- To enable you to use statistical tools for presentation of data and to understand presentations of data
  - By discussing when different types of graphical displays are appropriate and explaining proper methods of constructing graphical displays
  - By using appropriate summary statistics to describe the distribution of data
  - By introducing statistical terminology used to describe data and distributions

- To enable you to analyze data
  - By constructing and interpreting confidence intervals
  - By conducting and interpreting hypothesis tests
  - By using simple linear regression for bivariate data
- To enable you to understand basic probability and statistical concepts
  - By presenting and applying rules of probability
  - By study of the common discrete and continuous distribution used to model biological data
  - By discussing sampling distributions and the use of the Central Limit Theorem as the foundation of inference
- To enable you to evaluate statistical procedures and summaries
  - By discussing assumptions and conditions for analysis procedures
  - By identifying sources of bias in sampling, experiment, and survey methods
  - By discussing appropriate nature and scope of conclusions for analysis procedures
  - By discussing case studies in the life sciences

Homework: Required homework problems will be assigned for each topic covered in the course, and solutions will be submitted and graded via carmen. Recommended problems will also be posted for additional practice, but will not be collected or graded. You need to work through homework problems on your own in a timely manner in order to perform well in the class. Homework is worth 15% of your overall grade.

Labs: Lab exercises using the R software will be carried out once per week during the regular lecture time. These lab exercises will be submitted via carmen quizzes, and will together account for 10% of the overall grade.

Discussion board posts: At two points during the semester, you will be required to post something on the class discussion board that shows an improper use of statistics. This could be a graph, statistical hypothesis test, discussion of data, etc., that you find in a news article, blog post, or twitter thread, for example. Each post should be accompanied by a couple of sentences describing what is incorrect. You will also be required to comment on at least two of the other students' posts, to either agree, point out an additional problem, or argue that the posted information is actually correct. Your first post and set of comments should be completed before the first exam, and your second should be completed before the end of the semester. Each post and set of comments is worth 5% of your grade.

Exams: There will be two in-class exams and a final exam. Statistical tables will be provided as needed. Calculators may be used on the exams, but the calculators on cell phones, PDAs, or any other communication device are NOT allowed. Please note the dates of all exams as given on the syllabus.

Formulas for use on the exams: Formula sheets will be provided for all exams. The formulas sheets will be made available prior to the exams to assist in exam preparation.

Makeup exams: If you absolutely need a makeup exam and have a valid excuse, please see me for the necessary arrangements. However, you must notify me in advance in such a situation. A make-up exam

should be taken within a week of the missed exam. Exceptions to this policy will be permitted only in extreme situations such as serious injury immediately prior to an exam or severe illness requiring hospitalization.

Full credit on exam problems: You need to show your justification for or work on each exam problem. Answers without work will not receive full credit.

Course attendance policy: You are expected to attend all lectures. Formal attendance records will not be kept, however, students are responsible for all material covered in class. Office hours should not be used for instruction on material that has already been covered in class.

Final Grade: Your final course grade will be based on the following weighting of assessment components:

Exam 1 – 20%	Homework – 15%
Exam 2 – 20%	Labs – 10%
Final Exam – 25%	Discussion board posts – 10%

Grading Scale:
Grades will be assigned according to the scale below, with course components weighted as listed above.

93-100 = A
90-92.9999 = A-
87-89.9999 = B+
83-86.9999 = B
80-82.9999 = B-
77-79.9999 = C+
73-76.9999 = C
70-72.9999 = C-
67-69.9999 = D+
60-66.9999 = D
< 60 = E

Academic Misconduct: 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://studentaffairs.osu.edu/info_for_students/csc.asp`).

In particular, please note that although students are encouraged to work together on lab assignments and homework, all students must submit their own written work IN THEIR OWN WORDS.

E-mail Correspondence: In order to protect your privacy, all course e-mail correspondence must be done through a valid OSU name.nn account. If you have not activated your OSU email account, you can activate your account at `https://acctmgt.service.ohio-state.edu/cgi-bin/KRB1EntryAdd`.

Special Accommodations: Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated, and should

inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; `http://www.ods.ohio-state.edu/`.

Tentative Lecture and Lab Schedule

Class No.	Date	Topic	Textbook Readings
1	8/26/20	Introduction, methods for summarizing data	Ch. 1 - 3
2	8/28/20	Intro to the R software	
3	8/31/20	Probability	5.1 - 5.3
4	9/2/20	Probability	5.5 - 5.6
5	9/4/20	Exploratory data analysis in R	
No class	9/7/20	**Labor Day Holiday**	
6	9/9/20	Conditional probability	5.7
7	9/11/20	Random sampling activity	
8	9/14/20	Law of total probability, Bayes Theorem	5.8 - 5.9
9	9/16/20	Random variables	5.4
10	9/18/20	Statistical distributions in R	
11	9/21/20	Hypothesis testing, Binomial test	Ch. 6, 7.2
12	9/23/20	χ^2 goodness-of-fit test	8.2 - 8.5
13	9/25/20	Hypothesis tests in R – part 1	
14	9/28/20	Poisson distribution	8.6
15	9/30/20	**EXAM 1**	Ch. 1 - 8
16	10/2/20	Hypothesis tests in R – part 2	
17	10/5/20	Analyzing proportions, odds ratios	9.1 - 9.3
18	10/7/20	Contingency tables	9.4
19	10/9/20	Contingency tables in R	
20	10/12/20	Normal distribution	10.1 - 10.4
21	10/14/20	Central limit theorem	10.5 - 10.6
No class	10/16/20	FALL BREAK	
22	10/19/20	t distribution and confidence intervals	11.1 - 11.2
23	10/21/20	One-sample t-test	11.3 - 11.4
24	10/23/20	Normal probability plots, t distribution	Chapter 13
25	10/26/20	Comparing two means, paired test	12.1 - 12.2
26	10/28/20	Comparing two means, unpaired test	12.3 - 12.7
27	10/30/20	Inference for the population mean in R	
28	11/2/20	**EXAM 2**	Ch. 9 - 12
29	11/4/20	Experimental and observational studies	Ch. 14
30	11/6/20	Power of hypothesis tests, NP tests	

31	11/9/20	ANOVA	15.1 - 15.2
No class	11/11/20	Veteran's Day	
32	11/13/20	ANOVA in R – part 1	
33	11/16/20	ANOVA	15.3 - 15.4
34	11/18/20	Case study	
35	11/20/20	ANOVA in R – part 2	
36	11/23/20	Correlation	Ch. 16
No class	11/25/20	Thanksgiving Break	
No class	11/27/20	Thanksgiving Break	
37	11/30/20	Regression	17.1 - 17.2
38	12/2/20	Regression	17.3 - 17.5
39	12/4/20	Regression in R	
40	12/7/20	Logistic regression	17.6 - 17.9
41	12/9/20	Course Summary & Review	All material

FINAL EXAM: TBD

Brief description of the assessment plan for STAT 2480.01 and STAT 2480.02
(Based on 2019-2020 assessment for STAT 2480)

a. GE ELOs

The expected learning outcomes are:

• ELO1: Students understand basic concepts of statistics and probability.
• ELO2: Students comprehend methods needed to analyze and critically evaluate statistical arguments.
• ELO3: Students recognize the importance of statistical ideas.

b. Course assessment plan and feedback loop

1. The undergraduate committee will periodically meet and discuss the core set of concepts that must be tested in Stat 2480.01 and 2480.02. In particular, the GE goals will be emphasized in establishing these concepts.
2. Pre- and post-tests were constructed to measure the attainment of the GE ELOs.
3. In light of student performance on the core concepts, the undergraduate committee will meet and review the syllabus regularly to make sure that it continues to meet the learning outcomes for the data analysis component of the GE requirement.

c. Means of assessment for each ELO

Pre- and post-tests were constructed to measure the attainment of the GE ELOs. A total of 10 questions were included on the pre- and post-tests, with the same questions appearing on each test. The test questions are presented in the Appendix. The pre-test was administered online, through the course management system, during the first week of the semester, and the post-test was also administered online during the last full week of the semester before the final exam. Students were told they needed to complete the tests in one sitting. ELO 1 was measured by assessment items 1, 4, 7, and 10. ELO 2 was measured by assessment items 2, 3, 6, 8, 9, and 10, and ELO 3 was measured by assessment items 1, 4, 5, and 6.

d. Criteria for successful achievement of each ELO

For each ELO, the percentage correct on each item is averaged across items for both the pre- and posttests so as to yield one final score per ELO, per test. Results are broken into two groups: students at the Columbus campus and students at the Regional campuses. Our goal is for at least 80% of the students in the course to answer items correctly on the post-test; we consider this to be very good performance and to demonstrate successful achievement of the ELOs. We also consider 70% to 79% correct on the post-test as good performance, and 60% to 69% correct on the post-test as fair performance.

e. Ongoing timeline for implementing GE assessment in the course

We plan to continue using the Pre-Test/Post-Test method to assess STAT 2480.01 and STAT 2480.02 in future semesters.

Appendix: 2019-20 Assessment Pre-/Post-Test

1. Suppose a particular outcome from a random event has a probability of 0.02. Which of the following statements represent correct interpretations of this probability?

(a) The outcome will never happen.

(b) The outcome will certainly happen two times out of every 100 trials.

(c) The outcome is expected to happen about two times out of every 100 trials.

(d) The outcome could happen, or it couldn't, the chances of either result are the same.

2. Which statistics may be used to summarize a set of categorical data? Select all that apply.

(a) Percent in each category

(b) The median

(c) The mean

(d) Number in each category

3. An ice cream truck owner collects data on the number of sales made each day and the average temperature that day. He computes a regression line for predicting the number of sales based on how far the daily temperature is from freezing (32 degrees Fahrenheit) and finds sales = 0.22 + 1.8 (degrees over 32 Fahrenheit). Identify the "y-intercept".

(a) 0.22

(b) 1.8

(c) 32

(d) Can't tell

4. If the occurrence of one event does not influence the outcome of another event, then two events are:

(a) conditional

(b) disjoint

(c) independent

(d) interdependent

5. The Caldwells want to buy a new car, and they have narrowed their choices to a Buick or an Oldsmobile. They first consulted an issue of Consumer Reports, which compared rates of repairs for various cars. Records of repairs done on 400 cars of each type showed somewhat fewer mechanical problems with the Buick than with the Oldsmobile. The Caldwells then talked to three friends, two Oldsmobile owners, and one former Buick owner. Both Oldsmobile owners reported having a few mechanical problems, but nothing major. The Buick owner, however, exploded when asked how he liked his car: "First, the fuel injection went out - $250 bucks. Next, I started having trouble with the rear end and had to replace it. I finally decided to sell it after the transmission went. I'd never buy another Buick." The Caldwells want to buy the car that is less likely to require major repair work. Given what they currently know, which car would you recommend that they buy?

(a) I would recommend that they buy the Oldsmobile, primarily because of all the trouble their friend had with his Buick. Since they haven't heard similar horror stories about the Oldsmobile, they should go with it.

(b) I would recommend that they buy the Buick in spite of their friend's bad experience. That is just one case, while the information reported in Consumer Reports is based on many cases. According to that data, the Buick is somewhat less likely to require repairs.

(c) I would tell them that it does not matter which car they bought. Even though one of the models might be more likely than the other to require repairs, they could still, just by chance, get stuck with a particular car that would need a lot of repairs. They may as well toss a coin to decide.

6. A 95% confidence interval indicates that:

(a) 95% of the intervals constructed using this process based on samples from this population will include the population mean

(b) 95% of the time the interval will include the sample mean

(c) 95% of the possible population means will be included by the interval

(d) 95% of the possible sample means will be included by the interval

7. A box contains 6 balls: 2 are red, 2 are white, and 2 are blue. Four balls are picked at random, one at a time. Each time a ball is picked, the color is recorded, and the ball is put back in the box. If the first 3 balls are red, what color is the fourth?

(a) Red

(b) White

(c) Blue

(d) Blue and white are equally likely and more likely than red.

(e) Red, blue, and white are all equally likely.

8. A college instructor wants to be 99% certain of the mean math anxiety score for freshman enrolled in college algebra. Which of the following is the best statistical procedure? Assume all assumptions have been met for using the procedure.

(a) Test one mean against a hypothesized constant.

(b) Test the difference between two means (independent samples).

(c) Test the difference in means between two paired or dependent samples.

(d) Test for a difference in more than two means (one way ANOVA).

(e) Test that a correlation coefficient is not equal to 0 correlation analysis.

(f) Use a chi-squared test of association.

(g) Construct Confidence Interval(s).

9. In a test to compare two populations means, which of the following α levels requires the least difference between the sample means in order to allow rejection of H 0 : μ 1 = μ 2 ? (Assume all other factors are equal).

(a) 0.11

(b) 0.06

(c) 0.04

(d) 0.007

(e) 0.003

10. A group of 30 introductory statistics students took a 25-item test. The mean and standard deviation were computed; the standard deviation was 0. You know that

(a) about half of the scores were above the mean

(b) the test was so hard that everyone missed all items

(c) a calculation error must have been made in determining the standard deviation

(d) everyone correctly answered the same number of items

Arts and Sciences Distance Learning Course Component Technical Review Checklist

Course: STAT 2480
Instructor: TBD
Summary: Statistics for the Life Sciences

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			• Carmen • Office 365 • MacMillan App • R
6.2 Course tools promote learner engagement and active learning.	X			• Carmen discussion boards • Zoom • Canvas conversations
6.3 Technologies required in the course are readily obtainable.	X			All are available via OSU site license
6.4 The course technologies are current.	X			All are updated regularly
6.5 Links are provided to privacy policies for all external tools required in the course.		X		Please provide privacy policy for R
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 provide accessibility policy for R 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.	X			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:

[a]The 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.

[b]Add 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

[c]Add 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.