BOB JONES UNIVERSITY
College of Arts & Science

Division of Mathematical Sciences

Ma/BA 320/329
Applied Statistics -- EXP
2023-24 First Semester

INSTRUCTOR INFORMATION

Instructors:	Dr. Laurel Carpenter	Mr. Charles Lacey
Offices:	Al 46	Al 70
Office Hours by appointment: Use the link below (also in Canvas)		
	https://calendly.com/llcarpen/appointment	https://calendly.com/clacey-bju
Preferred forms of contact: Microsoft Teams or email:		
	llcarpen@bju.edu	clacey@bju.edu
Lectures:	Ma/BA 320-1 (MW 8:00-8:50A.M., Al 210)	Ma/BA 320-2 (MW 3:00-3:50P.M., Al 210)
Labs:	Ma/BA 329-1 (TTh 8:00-8:50A.M., Al 219)	Ma/BA 329-2 (TTh 2:00-2:50P.M., Al 219)

Course Information

Catalog Description

[Applied Statistics is a] software-based course including discrete and continuous probability distributions, hypothesis testing, confidence intervals, correlation and regression. Not applicable toward an Actuarial Science major or a Mathematics major or minor. EXP

Prerequisite

Math ACT 20+, SAT 550+, Ma 090, or placement into Ma 103.

Textbook and Technology Requirements

- Textbook (recommended): *Elementary Statistics*, 13th edition, by Mario F. Triola
  ISBN 9780134462455
- Textbook (required): *Naked Statistics: Stripping the Dread out of Data* by Charles Wheelan
  ISBN 9780393347777 (paperback) or 9780393071955 (hardback)
- Laptop (required): Laptop must meet specifications required to run SPSS as well as institutional requirements for internet access while on campus.
  - Chromebooks and other devices that do not run a full Windows or Mac operating system will not be sufficient.
- Software (required): *SPSS basic grad pack* (version 29 or newer, check computer specifications before purchasing)
- Calculator (required): a basic, five-function $(+\ -\ \times\ \div\ \sqrt{})$ calculator is sufficient, cell-phone calculators are not appropriate

Course Context

Institutional Context

Applied Statistics is required for a diverse set of programs across the university including Information Technology, Kinesiology, Communication Disorders, Health Care Leadership, Pre-Physicians Assistant, Mathematics Education, Accounting, and Business Administration. It is a recommended course for many other majors.
Applied Statistics is a designated Experiential Learning (EXP) course.

This course supports the following goals, PLOs (program learning outcomes), and EXP outcome:

	The student will be able to…
Institutional Goal 4	Demonstrate critical thinking in analyzing, evaluating, and synthesizing information and ideas.
Accounting PLO 2	Create solutions to business problems while working in a team composed of individuals with a variety of roles and different levels of commitment.
Accounting PLO 4	Acquire skills necessary to use technology tools effectively and efficiently (and apply those skills) to develop the other learning outcomes
Div of Management Goal 3	Develop analytical, problem-solving and critical thinking skills to deal effectively with real-world business issues, resulting in God-honoring decisions.
Business Admin PLO 5	Synthesize the totality of their business education by analyzing and formulating business strategies, business position and its long-term direction, resources and competitive capabilities for implementing strategies formulated, and measuring the success of implemented strategies with a biblical worldview.
Computer Science PLO 1	Design and implement efficient solutions to problems in various domains.
Information Tech PLO 1	Identify and deploy appropriate technology to solve problems in various domains.
Information Tech PLO 3	Communicate technical information effectively, including business proposals and network documentation.
Health Sciences PLO 1	Develop a philosophy of health science practice that is biblically sound, scientifically supported, and consistent with best practices in the field.
Div of Teacher Ed Goal 1	Demonstrate a knowledge of content and pedagogy to be effective teachers.
Mathematics Ed PLO 2	Solve problems in theoretical and applied settings in a variety of mathematical contexts.
Mathematics Ed PLO 3	Progress logically from premises to valid conclusions in a variety of mathematical contexts.
Exercise Science PLO 4	Apply the skills and abilities to critically evaluate, interpret and integrate information from the scientific literature related to exercise and health.
Bruins Engage! EXP	describe and reflect critically over what has been learned, showing how faith integrates with learning and how learning will inform future personal and professional practices.

Course Goals

This course is designed to

CG1: Introduce the scope of statistical analysis to students in a variety of disciplines.
CG2: Define a general process for performing statistical analyses.
CG3: Identify the foundational statistical tools, including appropriate use of descriptives, hypothesis testing, confidence intervals, regression, and a brief introduction to time series
CG4: Address ethical concerns with data and data analysis from the perspective of society and the Bible.

Course Objectives

The student will be able to

1. Articulate the process for effectively using data to answer questions.
2. Understand data collection techniques (NCTM/CAEP A.4.2, A.4.3)* and perform basic descriptive analysis, including
   a. Creation/interpretation of statistical graphs (NCTM/CAEP A.4.2, A.4.3)
   b. Calculation/interpretation of summary statistics (NCTM/CAEP A.4.2)
3. Understand the basic principles of probability, including the Central Limit Theorem, and how they apply to inferential statistics (using predominantly normal random variables) (NCTM/CAEP A.4.1, A.4.5)
4. Construct the appropriate hypotheses based on the data and question of interest and determine the correct statistical tool to evaluate the hypotheses. (NCTM/CAEP A.4.2)
5. Use a standard statistical package (SPSS) to run basic data analysis.
6. Independently perform a basic data analysis.
7. Interpret the results of their analysis and communicate those results to the average user.
8. Identify and avoid ethical issues with the use of data and data analysis.

* National Council of Teachers of Mathematics

Course Assessments and Grading

Activities and Assessments

The course grade will be based on performance in the following activities.

Category	Points	Description
EXP Reflection	≈ 50 pts	• Experiential Learning Reflections ○ short reflection activities ○ EXP Reflection Paper ○ An unsatisfactory EXP Reflection Paper will result in an F in this course.
Weekly-Reflection and How-to-Manual Checks	≈ 60 pts	• Weekly Reflection: ○ 15 checkpoints, 3 points each (42 points total) ○ lowest score dropped ○ no make-ups available • How-to Manual: ○ 4 checkpoints, 5 points each (20 points total) ○ no make-ups available
Quizzes and Banana Design Homework	≈ 140 pts	• Quizzes: ○ 11 quizzes, 10 points each ○ lowest score dropped ○ no make-ups available • Homework: ○ 10 assignments, 5 points each ○ lowest score dropped ○ no make-ups available
Tests	400 pts	• Tests: ○ Test 1 (80 points) ○ Test 2 (100 points) ○ Test 3 (100 points) ○ Test 4 (120 points) ○ See “Late Tests” policy
Final Exam	150 pts	• Final Exam: In-class, closed-book, cumulative, 70-minute exam focusing on application
Statistical Analysis Project	200 pts	• Statistical Analysis Project: ○ Preliminary Draft (40 points) ○ Expanded Draft (60 points) ○ Final Draft (100 points) ○ An unsatisfactory grade (i.e., < 70%) on the final draft of the project will result in failure in this course. ○ See “Late Projects” policy
Extra Credit Reading Summaries	36 pts	• Reading Summaries: ○ 12 summaries, 3 points each ○ past-due summaries accepted at 2 points each

Grading Scheme

Final grades will be assigned according to a standard 10 percentage-point scale calculated out of the total points available during the semester (≈1,000 pts). Percentages will be rounded to the nearest whole percentage when determining final grades.

Extra Credit

Extra points are built into the course. No additional extra credit work will be granted.

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Late or Missing Work

- **EXP**
  - Missed submissions may be made up only by instructor approval. Except in extenuating circumstances, late submissions will be penalized 10 percent per day until four days are past; at which point, the submission will receive a grade of 0.
- **Assignments**
  - **Weekly Reflections:** No late work, no make-ups will be accepted. Missing work will receive a grade of 0.
  - **How-to Manual:** No late work, no make-ups will be accepted. Missing work will receive a grade of 0.
  - **Banana Design Homework:** Late work will receive no credit.
  - **Quizzes:** No late or make-up quizzes will be accepted. Missed quizzes will receive a grade of 0.
- **Tests:**
  - Missed tests may be made up only by instructor approval. Except in extenuating circumstances, late tests will be penalized 10 percent per day until four days are past; at which point, the test will receive a grade of 0.
- **Project submissions:**
  - Missed project submissions may be made up only by instructor approval. Except in extenuating circumstances, late project submissions will be penalized 10 percent per day until four days are past; at which point, the project submission will receive a grade of 0.
- **Reading Summaries:**
  - Summaries are worth up to 3 points before the due date, up to 2 points after the due date until the last lecture class of the semester, and 0 points thereafter.

Course Components

Bruins Engage EXP (Experiential Learning Experience)

This course has been approved for Bruins Engage! EXP credit and addresses each of the five criteria for experiential learning: engagement, mentorship, challenge, ownership, and reflection. It has been intentionally designed so that students are challenged to use everything they learn in this course in a real-world data analysis project. To receive EXP and course credit, students must satisfactorily complete all EXP assignments within the required timeframe, including:

- EXP pre-test
- EXP post-test
- Final summative reflection EXP questions with a grade of C- (28 out of 40) or higher
  - 150-word minimum for each of the four required elements.
  - Students may revise their summative reflection one time to meet the C- standard.
- Failure to complete any of the above will result in an F for the course.

Most Thursday labs will be set aside as time for students to be working on projects under the mentorship of their instructor. (Students should also be working on their projects at other times during the week).

Statistical Analysis Project

A major component of this course is the semester-long statistical analysis project. This project will demonstrate the student's ability to individually perform a thorough basic statistical analysis on a real-world data set and communicate the findings and decisions made from that data to an executive level audience.

- Students will work on this project in stages throughout the semester.
- The sequence in which the content of this course is delivered is specifically designed support the learning necessary to perform this statistical analysis.
- Projects will be checked for plagiarism.
- Failure to complete the Final Draft of the Project with a grade of C- (i.e., 70%) or higher will result in an F for the course.

Weekly Arc

The content delivery and practice in this course is specifically designed to support the student in the larger goal of performing the statistical analysis project. During a typical week, students will be expected to engage in the following activities:

- **Pre-lab:** watch videos going over SPSS procedures and take appropriate notes (due Mon 11:59pm)
- **Tuesday Lab:** complete lab learning activities with SPSS (mostly done in lab, due Tue 11:59pm)
- **Banana Design:** complete an assigned portion of a statistical analysis, post write-up in discussion board, and respond to two other posts (best if done by Thursday, due Sat 11:59pm)
- **Quiz:** demonstrate understanding of the week's content (due Sat 11:59pm)
- **Weekly Reflection:** write a one paragraph reflection on personal engagement and development during the week (due Sat 11:59pm)
- **Other essential activities:** Of course, students are expected to participate in all ***labs*** and ***lectures*** during the week as well as engage in other ***study*** activities and *project work* outside of class to gain understanding of the content and proficiency in the skills and to complete the project.
- Students will be expected to ***log*** their engagement in this course which should include:

Lectures (Monday and Wednesday)

Lecture classes will be used to present large concepts and draw connections between textbook material and application in larger settings. Lecture content is presented in an order that makes sense in performing a statistical analysis rather than in textbook order.

- Students will be given reading and/or exercises to be completed before each lecture class and are expected to come to class prepared to use this knowledge.
- Students are expected to actively participate in small group learning activities during class.
- Students should take notes in class that include explanations in their own words, not just copies of lecture slides.
- Missing more than two lectures during the semester may result in withdrawal from the course.

Labs (Tuesday and Thursday)

During **Tuesday** labs, students will apply the concepts they have been learning by using SPSS to work with data sets from multiple sources.

- Before lab, students will be required to work through pre-lab material on Canvas and update their How-to Manual; this information will be necessary to complete assignments during lab.

During **Thursday** labs, students are expected to make progress toward aspects of the statistical analysis project and EXP reflections as assigned.

For **all** labs,

- Students are expected to bring a current copy of their How-to Manual to each lab.
- Missing more than two labs during the semester may result in withdrawal from the course.

How-to Manual

The How-to Manual (HTM) is an instruction manual the student will build throughout the semester. It is expected that by the end of the semester, a student's How-to Manual will contain information and instructions on how to successfully perform and report a thorough statistical analysis.

- The HTM is to be the student's *original* work and printed on standard-sized paper.
- The HTM must be typed but may contain neat, hand-written annotations.
- Students are expected to keep their HTM current over topics from lecture, lab, and the textbook.
- Students are expected to add to their HTM while watching pre-lab videos.
- Students are expected to bring a current copy of their HTM to each lab and a print copy on days when tests are given in lab.
- The printed HTM is the student's only resource on quizzes and tests requiring SPSS.
- The HTM will be graded on sufficiency, organization, and thoroughness.
- Copied material should be minimal and proper citation is to be used to avoid plagerism.

Quizzes

Students will be quizzed over recent course content as well as the use of SPSS.

- Quizzes are to be completed outside of class in Canvas.
- Quizzes will be timed.
- Students may consult printed or digital resources during their quizzes but may not consult other people or artificial intelligences.

Tests

A test will occur at the end of each unit. All tests will be cumulative over the entire course up to that point.

- Each test cycle will include a non-SPSS portion administered during a lecture period and an SPSS portion administered during a lab period.
- Non-SPSS portions of tests will be closed book; calculators may be expected.
- SPSS portions of tests will require the use of SPSS and allow the use of the student's own printed How-to Manual.

Final Exam

The final exam will be a cumulative, written test and may include information from any of the lectures, labs, readings, and homework throughout the semester.

- The final exam will be closed book and may require a calculator.
- Students are expected to take the final exam with their lecture section according to the time published in the university final exam schedule. Exceptions must be cleared through the Office of the Registrar.

Reading Summaries

Summaries of readings in *Naked Statistics* are extra credit and are due in Canvas.

- Summaries should be typed in paragraph form and contain between 300 and 600 words.
- Summaries will be checked for plagiarism.

Outside of Class (Homework/Study and Project Work)

The content in this course is presented in an order that is used in a statistical analysis rather than in textbook order. Lectures focus on the statistical analysis process, labs focus on using SPSS to conduct a statistical analysis, and the textbook introduces the different statistical tests and tools that will be used. For this reason, it is important that students do more than just work exercises in the textbook. Studying should include

  - pre-reading assignments before lectures,
  - working through pre-lab material, Banana Design Homework, and quizzes,
  - updating study notes and the How-to Manual with new content after each lecture and lab,
  - working through examples from lectures to ensure understanding,
  - working through enough assigned exercises to ensure competence,
  - practicing SPSS techniques outside of lab,
  - reviewing topics from earlier in the course to keep them fresh (at least 30 minutes per week),
  - investing sufficient time for studying outside of class (at least two hours for each lecture and each lab; in other words, approximately nine hours per week), and
  - studying with others.

- Textbook readings and exercises are correlated to the lectures and labs and are posted in Canvas.
- A **Weekly Reflection** is due each Saturday and is graded by self-reflection on performance, study habits, and study log.
  - **Study Log:** Students will keep track of their study behavior by creating a study log which includes date of study, elapsed time, and types of study activities. Study log should include total study time.

Other

Classroom Decorum

The classroom is a professional environment. Students are expected to be respectful to their instructor and peers in behavior, attitude, attire, and use of technology. The instructor has the right to require students who are participating in distracting behavior to leave the class.

Attendance

- Students are allowed only 2 personal absences from lecture and only 2 personal absence from lab. Missing more than 20 minutes of any part of a lecture or lab will count as a full absence.
- Students who miss more than 2 lab or 2 lectures may be dropped from the course.
- Students should notify the instructor by email as soon as possible after an absence (preferably within 24 hours).
- If the absence is planned, the student should notify the instructor before missing class.
- Students who are absent are personally responsible to obtain notes from fellow classmates.
- BJU attendance policy is in effect (see https://home.bju.edu/bju-policies/ for details).

Academic Honesty and Integrity Policy

- BJU academic honesty and integrity policy is in effect (see https://home.bju.edu/bju-policies/ for details).
- The use of AI-generated content is prohibited in this class. All work must be solely a result of your own intellectual and creative efforts.
- Students turning in work or papers containing portions of work done for previous or concurrent courses will receive a 0 on that assignment. This behavior will be considered self-plagiarism and will be reported to the academic integrity committee as a violation of the course policies.

Copyright Policy

Course Schedule

BA/Ma 320

Fall 2023

Week	Monday	Tuesday	Wednesday	Thursday	Saturday
Unit 1 — Overview and Analysis of Categorical Variables					
1			**23-Aug**	**24-Aug**	**26-Aug**
			Lecture	*Lab (AL 219)*	WR (Weekly Reflection) BD 1 (Banana Design HW) Quiz 1
2	**28-Aug**	**29-Aug**	**30-Aug**	**31-Aug**	**2-Sep**
	Lecture	*Lab*	*Lecture*	*Project*	WR / BD 2 / Quiz 2
3	**4-Sep**	**5-Sep**	**6-Sep**	**7-Sep**	**9-Sep**
	No class	*Lab*	*Lecture*	*Project*	WR / BD 3 / Quiz 3
4	**11-Sep**	**12-Sep**	**13-Sep**	**14-Sep**	**16-Sep**
	Lecture	*Lab*	*Lecture*	*HTM Check 1 / Review*	WR / BD 4 / Quiz 4
Unit 2 — Analysis of Quantitative Variables					
5	**18-Sep**	**19-Sep**	**20-Sep**	**21-Sep**	**23-Sep**
	Test 1	***Test 1***	*Lecture*	*Project*	WR **Project - Preliminary Draft**
6	**25-Sep**	**26-Sep**	**27-Sep**	**28-Sep**	**30-Sep**
	Lecture	*Lab*	*Lecture*	*Project Reflection Day*	WR / BD 5 / Quiz 5
7	**2-Oct**	**3-Oct**	**4-Oct**	**5-Oct**	**7-Oct**
	Lecture	*Lab*	*Lecture*	*Review* *HTM Check 2*	WR / BD 6 / Quiz 6
8	**9-Oct**	**10-Oct**	**11-Oct**	**12-Oct**	**14-Oct**
	Test 2	***Test 2***	*Lecture*	*Project*	WR
Unit 3 — Multivariable Analysis (ANOVA) and Communication					
9	**16-Oct**	**17-Oct**	**18-Oct**	**19-Oct**	**21-Oct**
	Fall Break	*Fall Break*	*Lecture*	*Project*	WR / BD 7 / Quiz 7
10	**23-Oct**	**24-Oct**	**25-Oct**	**26-Oct**	**28-Oct**
	Lecture	*Lab*	*Lecture*	*Project Reflection Day*	WR / BD 8 / Quiz 8
11	**30-Oct**	**31-Oct**	**1-Nov**	**2-Nov**	**4-Nov**
	Lecture	*Review* *HTM Check 3*	***Test 3***	***Test 3***	WR **Project - Expanded Draft**
Unit 4 — Correlation and Regression					
12	**6-Nov**	**7-Nov**	**8-Nov**	**9-Nov**	**11-Nov**
	Lecture	*Lab*	*Lecture*	*Project Reflection Day*	WR / BD 9 / Quiz 9
13	**13-Nov**	**14-Nov**	**15-Nov**	**16-Nov**	**18-Nov**
	Lecture	*Lab*	*Lecture*	*Project*	WR / BD 10 / Quiz 10
	Thanksgiving Break - November 20-24				
14	**27-Nov**	**28-Nov**	**29-Nov**	**30-Nov**	**2-Dec**
	Lecture	*Review* *HTM Check 4*	***Test 4***	***Test 4***	WR / Quiz 11 **Project - Final Draft**
Unit 5 — Course Conclusions					
15	**4-Dec**	**5-Dec**	**6-Dec**	**7-Dec**	**9-Dec**
	Final Review	*Final Review*	*Final Review*	*Project Reflection Day* ***EXP Reflection Due***	WR
16	***Final Exam Week***				
	BA/Ma 320 Section 1 (8:00 am lecture) -- Thursday, December 14th, 8:00-9:10 A.M.				
	BA/Ma 320 Section 2 (3:00 pm lecture) -- Monday, December 11th, 3:30-4:40 P.M.				

Schedule is tentative and may be revised at any time; changes will be announced in class or via Canvas.