

Ma/BA 320/329  
**Applied Statistics**  
*2020-21 First Semester*

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**INSTRUCTOR INFORMATION**

Section:	Ma/BA 320-1	Ma/BA 320-2
Time/Room:	MW 8:00-8:50A.M., AI 210	MW 3:00-3:50P.M., AI 210
Instructor:	Dr. Laurel Carpenter	Mr. Charles Lacey
Email:	llcarpen@bju.edu	clacey@bju.edu
Office:	AI 46	AI 74
Office Hours:	MWThF 1:30-2:30P.M. (via Teams) T 3:30-4:30P.M. (via Teams) Other times by appointment	MWF 10:00-10:50A.M. (via Teams) T 2:00-2:50P.M. (via Teams) Th 1:00-1:50P.M. (via Teams) Other times by appointment

**COURSE INFORMATION****Catalog Description**

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.

**Prerequisite**

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

**Textbook and Technology Requirements**

- Textbook (required): *Elementary Statistics*, 13<sup>th</sup> edition, by Mario F. Triola ISBN 9780134462455
- Textbook (recommended): *Naked Statistics: Stripping the Dread out of Data* by Charles Wheelan ISBN 9780393347777 (paperback) or 9780393071955 (hardback)
- Textbook (recommended): *Storytelling with Data: A Data Visualization Guide for Business Professionals* by Cole Nussbaumer Knaflic ISBN 9781119002253 (available free in digital form through Mack Library)
- SPSS (strongly recommended): computer app for data analysis, student version basic grad pack is sufficient (version 26 or 27, check computer specifications before purchasing)
- Microsoft Office Lens (recommended): free app to convert handwritten work to PDF files
- Microsoft Teams (required): free app offering chat, collaboration, and conferencing

**COURSE CONTEXT****Institutional Context**

This course supports the following:

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.

### **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 ASSESSMENT AND GRADING**

#### **Activities and Assessment**

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

<b>Category</b>	<b>% of Grade</b>	<b>Description</b>
Lab Assignments	11 % 110 pts	• Lab Assignments: Weekly lab assignments to be completed mostly in lab focusing on data analysis using SPSS (11, 10 points each)
How-to-Log	5 % 50 pts	• How-to-Log: Semester-long compilation of instructions on performing a statistical analysis (2 peer reviews + final submission, 50 points total)
Homework	4 % 40 pts	• Homework: Out-of-class exercises for each unit (4, 10 points each)
Writing	4 % 40 pts	• Discussion Boards: Read-post-respond discussions on current real-world statistics (4, 10 points each) • Reading Summaries: Half-page summaries of chapters from <i>Naked Statistics</i> (10, 3 points each)
Quizzes	6 % 60 pts	• Unit Quizzes: Canvas, open-book, timed quizzes focusing on skills from the first half of each unit (4, 10 points each) • Communications Quizzes:
Tests	36 % 360 pts	• Unit Tests: In-class, closed-book, 50-minute tests focusing on applications from the unit but with a cumulative portion (4, 90 points each)
Final Exam	14 % 140 pts	• Final Exam: In-class, closed-book, cumulative, 70-minute exam focusing on application (1, 140 points)
Project	20 % 200 pts	• Semester project independently performing a complete statistical analysis (5 submission points, 200 points total)

## Labs

- Students will be assigned lab groups.
- **Lab Assignments:**
  - Lab assignments will open at the beginning of lab and will be due in Canvas at 11:59pm the same day.
  - Lab groups may consult together while working on lab assignments, but work that is turned in must be original to the individual.
- **How-to Log:**
  - The How-to Log is an instruction manual that the student will add to continually throughout the semester. It is expected that by the end of the semester, a student's How-to Log will contain information and instructions on how to successfully perform and report a thorough statistical analysis.
  - The first two submission of the How-to Log are peer-reviewed. Students will receive 5 points for submitting their How-to Log for review and 5 points for reviewing one other student's How-to Log within the time frame.
  - The final submission of the How-to Log is instructor graded and is worth 30 points.

## Homework

Because homework is one of the primary means by which students develop good statistical insight, it is crucial to success in this course. Homework in statistics includes more than just working *exercises*. Homework also includes reading and understanding textbook examples and being able to make connections and apply statistics in many different scenarios. For this reason, personal study habits will be considered as important as working exercises.

- Readings and Exercises are correlated to the lectures and labs and are listed in the Course Guide on Canvas.
- Homework is due on Saturday before each Unit Test and is graded by a self-evaluation on performance and study habits via Canvas.

## Discussion Boards

Discussion board activities in Canvas are designed to help students draw connections between the course content and how it is applied. Each discussion board includes a reading (or assignment), an original post, and two or three response posts.

## Reading Summaries

Summaries of readings in *Naked Statistics* are worth a total of 30 points extra credit and are due in Canvas.

## Quizzes

- All quizzes are in Canvas and are timed.
- **Unit Quizzes** occur at the midpoint of each unit and focus on information from the first half of the unit.
- **Communications Quizzes** focus on applying information based on readings from *Storytelling with Data* as well as information given in class.

## Tests

- Unit tests are written tests and occur in lecture class on the days designated in the schedule.
- Each unit test will focus on information from that unit but may also contain questions from previous units.

## Final Exam

- The final exam is a written test and occurs at the time designated in the university final exam schedule according to your lecture section.
- The final exam is cumulative and may include information from any of the lectures, labs, readings, and homework throughout the semester.

## Late or Missing Work

- **Assignments (including Labs, Homework, Discussion Boards, and Quizzes):**
  - Students are expected to turn in assignments on time. Missing work will be given a grade of 0.
  - Assignments may be accepted late in extenuating circumstances only by instructor approval.
- **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 be given a grade of 0.
- **Project submissions:**
  - Missed tests may be made up only by instructor approval. Except in extenuating circumstances, late tests will be penalized 10 percent per day.

### **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 ( $\approx 1,000$  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.

### **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 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).

#### **Copyright Policy**

© 2020/2021 (Carpenter and Lacey) as to this syllabus and all lectures. Students are prohibited from selling (or being paid for taking) notes during the course to (or by) any person or commercial firm without the express written permission of the professor teaching the course.

**COURSE SCHEDULE**

Week	Monday	Tuesday/Thursday (Lab)	Wednesday	Saturday
<b>Unit 1 — Overview and Step 1: Defining Variables and Research Questions</b>				
1		18-Aug (20-Aug) <b>Lab: Intro to Tech</b>	19-Aug Lecture	22-Aug
		-- Unit 1 Homework --		
		Discussion Board: Stats in my Major (due 22-Aug)		
2	24-Aug Lecture	25-Aug (27-Aug) <b>Lab: Graphing Variables</b>	26-Aug Lecture	29-Aug <b>Unit 1 Quiz</b>
		-- Unit 1 Homework --		
3	31-Aug Lecture	1-Sep (3-Sep) <b>Lab: Sample Analysis</b>	2-Sep Lecture	5-Sep
		Unit 1 Homework (due 5-Sep)		
		Discussion Board: Ethics (due 5-Sep)		
<b>Unit 2 — Step 2: Descriptive Statistics and Step 3a: CIs</b>				
4	7-Sep <b>Unit 1 Test</b>	8-Sep (10-Sep) <b>Lab: Developing Good Questions</b>	9-Sep Lecture	12-Sep
		-- Unit 2 Homework --		
		<b>Quiz: Communicating Descriptives</b> (due 12-Sep)		
		-- Project: Questions and Variables --		
5	14-Sep Lecture	15-Sep (17-Sep) <b>Lab: Descriptives I</b>	16-Sep Lecture	19-Sep <b>Unit 2 Quiz</b>
		-- Unit 2 Homework --		
		Project: Questions and Variables (due 19-Sep)		
6	21-Sep Lecture	22-Sep (24-Sep) <b>Lab: Descriptives II</b>	23-Sep Lecture	26-Sep
		Unit 2 Homework (due 26-Sep)		
		Discussion Board: Article I (due 26-Sep)		
		-- Project: Descriptives and Cis --		
<b>Unit 3 – Step 3b: Hypothesis Testing</b>				
7	28-Sep <b>Unit 2 Test</b>	29-Sep (1-Oct) <b>Lab: Calculating CIs</b>	30-Sep Lecture	3-Oct
		-- Unit 3 Homework --		
		Project: Descriptives and Cis (due 3-Oct)		
8	5-Oct Lecture	6-Oct (8-Oct) <b>Lab: HTs I</b>	7-Oct Lecture	10-Oct <b>Unit 3 Quiz</b>
		How-to Log Peer Review I (submission due 7-Oct, response due 10-Oct)		
		-- Unit 3 Homework --		
		-- Sign up for Project Conference --		
		-- Project: Analysis Plan -- (due at conference 9-Oct through 16-Oct)		

Week	Monday	Tuesday/Thursday (Lab)	Wednesday	Saturday
9	12-Oct Lecture	13-Oct (15-Oct) -- No Labs --	14-Oct Lecture	17-Oct
				Unit 3 Homework (due 17-Oct)
-- Project: Analysis Plan -- (due at conference 9-Oct through 16-Oct (Fri))				
<b>Unit 4 – Step 4a: Correlation and Regression</b>				
10	19-Oct <b>Unit 3 Test</b>	20-Oct (22-Oct) <b>Lab: HTs II</b>	21-Oct Lecture	24-Oct
				Quiz: Communicating Inference (due 24-Oct)
				-- Unit 4 Homework --
				Discussion Board: Article II (due 24-Oct)
-- Project: Inference --				
11	26-Oct Lecture	27-Oct (29-Oct) <b>Lab: 2-Var Correlation &amp; Regression</b>	28-Oct Lecture	31-Oct <b>Unit 4 Quiz</b>
				-- Unit 4 Homework --
				Project: Inference (due 31-Oct)
12	2-Nov Lecture	3-Nov (5-Nov) <b>Lab: Multi-Var Regression</b>	4-Nov Lecture	7-Nov
			How-to Log Peer Review II (submission due 4-Nov, response due 7-Nov)	
				Unit 4 Homework (due 7-Nov)
-- Sign up for Project Conference --			-- Project Conferences -- (6-Nov through 13-Nov (Fri))	
			-- Project: Regression -- (due 14-Nov, not due at conference)	
<b>Unit 5 – Course Conclusions</b>				
13	9-Nov <b>Unit 4 Test</b>	10-Nov (12-Nov) -- No Labs --	11-Nov Lecture	14-Nov
-- Project Conferences -- (6-Nov through 13-Nov (Fri))				
				Project: Regression/Rough Draft (due 14-Nov)
14	16-Nov Lecture	17-Nov (19-Nov) <b>Lab: Fun with Data</b>	18-Nov <b>Day of Rest</b>	21-Nov
			How-to Log Final Draft (due 20-Nov ( <b>Fri</b> ))	21-Nov
-- Project: Final Report (due 4-Dec) --				
<b>Final Exam: Saturday 21-Nov 3:30-4:40 Ma320-2</b> <b>Final Exam: Tuesday 24-Nov 8:00-9:10 Ma320-1</b> <b>Project: Final Report Friday 4-Dec 11:59</b>				
This schedule is subject to change. Changes to this schedule will be posted in Canvas.				