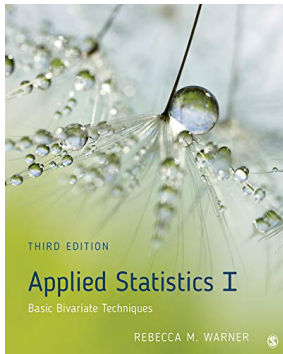


San José State University
COSS/Psychology
Statistics 245-01, Advanced Statistics, Fall 2023

Course and Contact Information

Instructor:	Gregory J. Feist
Office Location:	DMH 313
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Email:	greg.feist@sjsu.edu
Office Hours:	T TH 9AM -10AM; DMH 313
Class Days/Time:	T TH 10:30-11:45AM
Classroom:	DMH 359
Final:	Dec May 13 (9am to 11:59pm; online/home)
Prerequisites:	Stat 115 or instructor consent

Required Texts/Readings (Required)



Rebecca M. Warner (2021). *Applied Statistics I: Basic Bivariate Techniques*. Sage

ISBN 978-1-5063-5280-0

\$89-\$110; \$45-\$70 eTextbook rental
\$71 print rental; \$104 Print; \$90 Digital Purchase

Amazon
SJSU Textbook Store

- **Other technology requirements**
 - R (<http://cran.r-project.org/>)
 - R Studio (<http://www.rstudio.com>)
 - R Markdown <https://rmarkdown.rstudio.com/index.html> [optional]

Course Information/Description

This course examines basic and more advanced principles of the logic of science and hypothesis testing, probability, descriptive statistics, graphing and plotting, data, significance testing, power, and various one-way Analyses of Variance (ANOVA). **This course assumes you have learned these procedures in previous courses.** We're going to cover a fair amount of somewhat complex material relatively quickly. You must have taken Stat115 or its equivalent to enroll in this course.

As the primary goal of this course is to help you become an informed consumer and practitioner of research by being comfortable with data, we'll address these statistical procedures from a conceptual approach. Rather than getting caught up in their mathematical (i.e., matrix algebra) foundations, we'll focus on application and interpretation. For each procedure, we will cover three basic questions: what is it, why/when might one use it,

and how might one appropriately conduct, interpret, and communicate it. More specifically, for each procedure we'll address the following:

- defining the procedure (what is it)
- describing research situations where the procedure may be appropriate (why and when use it)
- discussing underlying requirements and assumptions of the procedure (how use it appropriately)
- conducting the analysis using computer software packages (how to conduct the analysis)
- interpreting computer output (how to interpret the analysis)
- identifying and addressing issues and problems that may arise in using the procedure
- communicating the results of the analysis in standard APA format (how to communicate the analysis)

A critical component of the class is the use of statistical software to conduct the procedures covered. As *R* is the most popular and readily available opensource software, we'll use it to create and execute files that define data and conduct statistical analyses. We'll go over the output generated from these analyses during class.

Faculty Web Page and MYSJSU Messaging

Unless otherwise announced in class, all graded assignments will be accepted only in electronic form using the Canvas learning management system assignments page ([Canvas](https://sjsu.instructure.com/) is available at <https://sjsu.instructure.com/>). Having access to the Internet is your responsibility, so have backup plans in case you have problems with your primary computer. I cannot accept excuses about technology problems as valid, unless the entire University network or all of Canvas is offline.

Supplementary course material will be made available on Canvas regularly. Communication regarding the course will be sent via the e-mail address linked to your MySJSU account or posted to Canvas. It is your responsibility to make sure you are enrolled in Canvas and receiving my e-mails.

Program Learning Outcomes (PLOs)

Upon successful completion of the requirements for the MA in Research and Experimental Psychology, students will be able to:

Goal 1. Knowledge Base – Students completing the MA in Psychology program will understand the major theoretical perspectives and research methods across areas of experimental psychology, i.e., Developmental, Social, Cognitive, and Physiological.

- PLO 1.1 – Understand the major theoretical perspectives and research methods across areas of experimental psychology, i.e., Developmental, Social, Cognitive, and Physiological.

Goal 2. Research Methods & Scholarship – Graduates of our program will possess an advanced level of competence in research methods, statistical techniques, and technical writing skills. Students completing the MA in Psychology program are required to complete a thesis. The thesis will:

- PLO 2.1 – demonstrate creative problem-solving in the design, implementation of empirical research.
- PLO 2.2 – demonstrate project management skills in the implementation of empirical research.
- PLO 2.3 – demonstrate advanced competency in the statistical analysis and interpretation of empirical research findings.
- PLO 2.4 – be able to communicate (oral and written) their research findings at a professional level.

Goal 3. Career Enhancement – Graduates of our program will experience career enhancement through placement in a doctoral program or acceptance of a position requiring a master’s in psychology in the public or private sector. Students completing the MA in Psychology program will:

- PLO 3.1 – achieve career enhancement through placement in a doctoral program or acceptance of a position requiring a master’s in psychology in the public or private sector

STAT 245 contributes to PLOs 2.1, 2.3, 2.4 and 3.1.

Course Learning Outcomes

The goals of this course are to help you: build a solid conceptual understanding of statistics in research, develop the practical skills to use statistics in your own research, and become a self-directed learner.

Upon successful completion of this course, you will be able to:

- CLO 1 – Define and apply advanced statistical procedures, including those associated with: logic and ethics of quantitative analysis, probability theory, hypothesis testing, effect size, ANOVA and bivariate correlation
- CLO 2 – Describe which statistical procedures are appropriate for a given research situation
- CLO 3 – Discuss the underlying requirements and assumptions of statistical procedures
- CLO 4 – Conduct and interpret statistical analysis using computer software (R)
- CLO 5 – Communicate results of statistical analysis in APA style for scientific publication.

The learning objectives will be assessed via written assignments and exam questions.

The course learning objectives were adapted from those of Dr. Sean Laraway, Dr. Howard Tokunaga. and if applicable, for General Education (GE), American Institutions (AI), and Graduation Writing Assessment Requirement (GWAR) courses Information may be found in [Guidelines for GE, AI, GWAR](http://www.sjsu.edu/senate/docs/2014geguidelines.pdf) (<http://www.sjsu.edu/senate/docs/2014geguidelines.pdf> per [University Policy S14-5](http://www.sjsu.edu/senate/docs/S14-5.pdf), at <http://www.sjsu.edu/senate/docs/S14-5.pdf>) effective Fall 2014

Additional Readings will be made available on the Canvas site.

Course Requirements and Assignment

Homeworks (14% of grade - 140 pts)

Throughout this semester, there will be two main types of homework assignments. Both types of assignments will be submitted via Canvas as GoogleDoc, Word or PDF files.

1. *Statistical Analyses Homeworks (9% due @ 11:59pm (100 points)*

The first type of homework, designed to help teach you to conduct and interpret the results of statistical analyses, asks you open data files in R, run analyses in R, and bring the output of these analyses to class to facilitate discussion. There will be **9 of these** assignments, each worth a maximum of **10 points**. NOTE: Depending on the assignment, **late homework** (turned in no later than one class past its original due date) may be accepted with a **deduction of 5 points/day**.

2. *Evaluation/Questions/Comments on Readings (5% due @ 11:59pm on CANVAS (45 points)*

The second type of assignment consists of reading for that chapter and providing questions or comments you have about it. Have at least 2 questions/comments/observations per most weeks. There will be **10 of these question assignments, each worth 5 points**. Because of the nature of these assignments, **late questions will not be accepted**.

Class participation (7.5% of grade - 75 pts)

Active student participation during class sessions is an essential component in graduate school, which means you need to make every effort to attend all class sessions. Missing more than 1 or 2 classes will result in a lower participation score. Discussion will also revolve around your weekly questions or comments so will also be considered part of “participation.” There may be times when you feel confused, bemused, frustrated, or perturbed. I need and expect you to express your questions, thoughts, and feelings during class. There is no such thing as a stupid question – really! Class participation will be a determining factor for students whose course grade is 'borderline' (ie, slightly below the cutoff for the next highest grade).

Exams (30% of grade - 300 pts)

There will be two midterm exams. The first exam will be worth 120 points and the second worth 180. The exams will address the ability to interpret computer output as well as discuss relevant conceptual and statistical issues. There will be no make-up exams without prior notification and agreement. Exams will be ONLINE (Canvas) from 12pm to 11:59pm day of exam.

Paper (23.5% of grade - 235 pts)

There will be one paper, **due Dec 6th**. The first part of this assignment is to turn proposal for your final paper. The **proposal is due Nov 16th and is worth 15 points**. The purpose of this full paper (approximately 8-10 pages in length) is to give you practice in conducting analyses on a set of data, interpreting the results of these analyses, and writing up the findings in standard APA format. It is worth **220 points**.

You will pick a data set from class of your choosing and conduct any series of analyses we covered during the semester, write up the results with APA Tables and Figures. Make sure the analysis is not exactly one we did already in class or is in the book. That is, choose some variables in a data set not already chosen. That doesn't mean ALL variables must be completely new, but at least half of them. You may choose to do more than one statistical analysis on your dataset (e.g., factor analysis and sequential regression) but that is not required. You will need to include a full copy of your R syntax and output files. **Late papers may be accepted with substantial penalty (10 points a day)**.

It will be a full style APA paper, with intro, method, results, and discussion. Include Title page and Reference page in APA format (7th edition).

- **Intro** should be only about 2 pages and review at least 10 papers (of your own finding) on that topic. Summarize the main findings and lead to the research questions you will be addressing in this paper. The intro should end with a clear statement of predictions or research questions.
- **Method** section needs to match the sample and sample size in the data set, but the procedures (when and how data were collected) can be your own creation. If the data set describes and uses specific measures, then find them in the literature and describe them (and cite creators/original source). (also about 2 pages)
- **Results** Write up full description of results as per Schumacker & APA Guide. Include at least one APA style table or figure (about 1.5 to 2 pages). *Include your R-scripts in an Appendix.*
- **Discussion** (about 2 pages). Given your introduction and predictions, summarize your results, describe the implications of your findings. Also, describe the limitations of your design and results, and end with any unanswered questions and/or what is the next step in this line of research.

The paper will be graded on

- **APA format:** including title page, tables, results, figures, citations, and references (30 points)
- **Content:** do you have all of the parts, including R-scripts in Appendix (40 points)
- **Statistical Analysis:** were your statistics appropriate ones to answer your question/test your prediction? Were they done correctly? (45 points)
- **Interpretations:** were your conclusions and interpretations of the output correct? (35 points)

- **Writing Style:** how clearly do you write? Grammatical clarity? Need much editing? (70 points)

Final examination (25% of grade - **250 pts**) – **Dec 13th**. The final examination is cumulative and non-cumulative (since 2nd exam) and will emphasize conceptual and pragmatic issues addressed throughout the semester.

Grading criteria (of 1,000 points)

<u>Grade</u>	<u># points</u>	<u>Grade</u>	<u># points</u>
A+	950 <		
A	920 - 949	C	720 - 769
A-	900 - 919	C-	700 - 719
B+	870 - 899	D+	670 - 699
B	820 - 869	D	620 - 669
B-	800 - 819	D-	600 - 619
C+	770 - 799	F	< 600

Rounding is Included in the Grading Scale

The point totals reflect rounding up to the nearest percentage. For example, an A- would normally require 90%. With rounding, it only requires 89.5%. Because rounding is built in to the grading scale, your grade will be based on your final point total, rounded to the nearest whole percentage point (so 89.5% is an A-, but 89.4% is a B+). **To be fair to everyone in the class, these are firm cutoffs, so please don't ask for additional bumping up.**

Classroom Protocol

Respectful disagreement and debate are encouraged. However, unprofessional, disrespectful, or disruptive behavior is a violation of the Student Code of Conduct, available at <http://www.sjsu.edu/studentconduct/docs/Student%20Conduct%20Code%202013.pdf>. Such behavior may result in being asked to leave the class and/or referrals to the Office of Student Conduct and Ethical Development.

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' [Syllabus Information web page](http://www.sjsu.edu/gup/syllabusinfo/) at <http://www.sjsu.edu/gup/syllabusinfo/>

You must obtain the instructor's permission to make any audio or video recordings in this class. Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation/studying, or course related activities, including but not limited to internships, labs, and clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.

Course Schedule

Week	Date	Book Chapter/Topic/Lecture	Homeworks (usually due Frid) Discussion Questions (due Wed)
1	Aug 22-24	Ch1 Lec 1 Introduction to Advanced Statistics Ch1 Lec 2: Evaluating Numerical Information	
2	Aug 29-31	Ch 2 Lec3: Basic Research Concepts Ch 2: Lec 4: Basic Research Concepts	Ch 1 Questions: Due Aug 30
3	Sept 5-7	Lec 5: R Basics Lec 6: R Basics	Introduction to R: https://youtu.be/yYa9WBkja4k Load Data in R: https://youtu.be/zwY8_lkp0B0 Quick tips for coding in R: https://youtu.be/5TcE-TTne0k Online book for R Basics and Data Analysis in General Homework #1 (R) Sept 8
4	Sept 12-14	Ch 4 Lec 7: Descriptive Statistics Ch 4: Lec 8: Descriptive Statistics	Ch 4 Questions Sept 11 Homework #2 Sept 15
5	Sept 19-21	Ch 5: Lec 9 Graphing and Plotting Data Lec 10: Graphing and Plotting Data in R	Ch 5 Questions Due Sept 18 RMarkdown: Creating Graphs with ggplot2 https://www.youtube.com/watch?v=K418swtFnik Bar Plots: https://youtu.be/-ZKoxYqzQpY Box Plots: https://youtu.be/cA92s6WVtww Histograms: https://youtu.be/M4m85GjZKhw Scatterplots: https://youtu.be/eXBZiLiSN5I Homework #3 Sept 22
6	Sept 26-28	Exam 1 (Sept 26) Ch 6 Lec 11: Normal Distribution, Skewness and Z-scores	
7	Oct 3-5	Ch 6 Lec 12: Normal Distribution, Skewness and Z-scores Ch 7: Lec 13: Sampling Error and Confidence Intervals	Ch 6 Questions Due Oct 2 Homework #4 Sept 6
8	Oct 10-12	Ch 7: Lec 14: Sampling Error and Confidence Intervals Ch 9 Lec 15 Significance Testing, Effect Size & Power	Ch 7 Questions Due Oct 9 Homework #5 Oct 13
9	Oct 17-19	Ch 9 Lec 15 Significance Testing, Effect Size & Power Ch 13: Lec 16 One-Way ANOVA	Ch 9 Questions Due Oct 16
10	Oct 24-26	Ch 13: Lec 17 One-Way ANOVA Ch 13: Lec 18 One-Way ANOVA in R	Ch 13 Questions Due Oct 23 Homework #6 Oct 27

11	Oct 31 Nov 2	Exam 2 (Oct 31) Ch 15: Lec 19 One-Way Repeated ANOVA	
12	Nov 7-9	Ch 15: Lec 20 One-Way Repeated ANOVA Ch 15: Lec 21 One-Way Repeated ANOVA in R	Ch 15 Questions Due Nov 6 Homework #7 Nov 10
13	Nov 14-16	Ch 16: Lec 22: Factorial ANOVA Ch 16: Lec 23: Factorial ANOVA Paper Topic/Outline Due (Th Nov 16)	Ch 16 Questions Due Nov 13 Homework #8 Nov 17
14	Nov 21	Ch 16: Lec 24: Factorial ANOVA in R Thanksgiving Nov 23 (NO CLASS)	
15	Nov 28-30	Ch 10: Lec 27: Bivariate Correlation Ch 10: Lec 28: Bivariate Correlation	Ch 19 Questions Due Nov 29 Homework #9 Dec 1
16	Dec 5 Last Class Dec 6	Review Final Paper Due	
	Dec 13	Final Exam (9am-11:59pm, Canvas)	