

## **ANOVA for the Behavioral Sciences**

Department of Psychological Sciences

Purdue University

Class Meetings: MWF 8:30-9:20

Class Location: PSYC 3102 (lectures/exams) PRCE 255 (labs)

PSY 60601-001

Fall 2021

3 Credits

**Course Instructor:** Erin P. Hennes, PhD

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**Office Hours:** M 9:30-10:20

**Course Goals:** This course is intended as a first-semester graduate statistics course for students in psychology and related fields who conduct quantitative research. The course will begin with an accelerated review of fundamental concepts (e.g., data visualization, central limit theorem, probability) and then will focus primarily on statistical techniques for between- and within-person designs that include categorical independent variables (e.g., *t*-tests, ANOVA). The course aims to help students (a) develop a deeper conceptual understanding of foundational statistical principles, (b) appropriately analyze data by hand and using SPSS, and (c) properly interpret and report results of statistical analyses in APA format. This course also covers foundational principles for best practice for conducting empirical research, including measurement, database management, data cleaning, and syntax, as well as introduces students to topics such as alternatives to null hypothesis significance testing, academic integrity, and replication. By the end of this course, students should have developed strong skills in managing their own data and should be able to comprehensively analyze and interpret the results of most commonly-used analyses of variance.

**Required Text:** Howell, D. C. (2013). *Statistical methods for psychology* (8<sup>th</sup> Ed). Belmont, CA: Wadsworth/Cengage.

### **Additional Articles:**

Crossman, M. K., & Kazdin, A. E. (2018). Perceptions of animal-assisted interventions: The influence of attitudes toward companion animals. *Journal of Clinical Psychology, 74*, 566-578.

Open Science Collaboration (2015). Estimating the reproducibility of psychological science. *Science, 349*, 943.

Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2011). False-positive psychology: Undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychological Science, 22*, 1359-1366.

Shrout, P. E., & Rodgers, J. L. (2018). Psychology, science, and knowledge construction: Broadening perspectives from the replication crisis. *Annual Review of Psychology*, 69, 487-510.

Vella, L., Ring, H. A., Aitken, M. R. F., Watson, P. C., Presland, A., Clare, I. C. H. (2018). Understanding self-reported difficulties in decision-making by people with autism spectrum disorders. *Autism*, 22, 549-559.

**Calculators:** A scientific calculator should always be brought to class. **You must be able to calculate standard deviations with your calculator.**

**Computer Software:** This class will be taught using IBM SPSS 27 and Microsoft Office 2019. SPSS is available from 3 sources:

1. Graduate students at Purdue are covered under Purdue's agreement with IBM for free installation of SPSS on personally owned (non-university) computers. To obtain a copy, navigate to <https://communityhub.purdue.edu/storefront/overview> and follow the instructions.
2. SPSS is available on campus in ITaP Instructional Computing Labs <https://www.itap.purdue.edu/facilities/instructionallabs/index.html>
3. SPSS can be accessed through ITaP Software Remote found here: <https://www.itap.purdue.edu/facilities/instructionallabs/index.html>.

**Lab:** During lab, you will review concepts discussed in lecture and will be taught how to use SPSS for data management and analysis. You are encouraged to bring a USB/thumb drive to lab or use a web-based storage program such as Dropbox or Gmail.

**Requirements:**

There are 844 total points possible. Your overall grade will be the percentage of 844 points obtained.

*Exercises* (24% of grade). There will be 8 exercises, each worth 25 points, or approximately 3% of the overall grade. Each assignment will ask you to calculate statistical tests by hand and using SPSS and to interpret and report your results in APA style. Graded exercises will be returned at the beginning of the following class meeting. Late exercises will be accepted until that time, but will be penalized 25%. Exercises will not be accepted after that time.

*Exams* (36% of grade). There will be 3 exams given during the course, each worth 100 points, or approximately 12% of the overall grade. Each exam will include conceptual questions (true/false, multiple choice, short answer), by-hand calculations, and interpretation and reporting of SPSS output using APA format. Exams may be taken early in the event of a documented professional schedule conflict (e.g., a conference). Students who miss an exam for any other reason may schedule a time to take the exam until the start of the subsequent class meeting, but will be penalized 40%. Exams may not be made up for any other reason unless due to exceptional emergency as reported to the university. Graded exams will be returned at the beginning of the following class meeting.

*Final Project* (36% of grade). You will use your own data to examine and report the results of a novel research question. You will clean the data and prepare it for analysis, analyze the data, and present the research question, methods, results, and brief discussion in the style of an abbreviated peer-reviewed article. If you do not have data of your own, you may test a research question from the classroom data that was not examined during the course. Half page proposals are due by the start of class November 22<sup>nd</sup> (worth 10 points, or approximately 1% of the overall grade). During the last week of class, each student will present their findings in a brief presentation (worth 90 points, or approximately 11% of the overall grade). The final paper (worth 200 points, or approximately 24% of the overall grade) will be due by 11:59 pm on the final exam day. Late projects will be accepted until 11:59 pm on December 19<sup>th</sup>, but will be penalized 10% for every day late.

*Class and Lab Participation* (5% of grade). You are expected to be active participants in class discussions and activities, and during lab sessions. Each class period is worth 1 point.

*Extra Credit*: There may be occasional opportunities for extra credit throughout the semester at the discretion of the instructor. Final grades are generally not curved, so students are strongly encouraged to take advantage of extra credit options when available. Please note that final grades are especially unlikely to be adjusted for students who have not completed extra credit.

#### **Overall Grade Scale:**

A+	97-100%
A	93-96%
A-	90-92%
B+	87-89%
B	83-86%
B-	80-82%
C+	77-79%
C	73-76%
C-	70-72%
D+	67-69%
D	63-66%
D-	60-62%

Week	Date	Day	Topic	Reading	Assignment Due
1	8/23	M	Introduction and basic concepts	Ch. 1	
	8/25	W	Data visualization	Ch. 2	
	8/27	F	<i>Lab</i>		
2	8/30	M	Measures of central tendency	Ch. 2	
	9/1	W	Measures of variability	Ch. 2	
	9/3	F	<i>Lab</i>		
3	9/6	M	<b>Labor Day (no class)</b>		
	9/8	W	The normal distribution	Ch. 3	<b>Exercise 1 (Ch. 1-2)</b>
	9/10	F	<i>Lab</i>		
4	9/13	M	Sampling distributions	Ch. 4	
	9/15	W	Probability	Ch. 5	
	9/17	F	<i>Lab</i>		
5	9/20	M	Power and effect size	Ch. 8	
	9/22	W	Review		<b>Exercise 2 (Ch. 3-5, 8)</b>
	9/24	F	<b>Exam 1 (Ch. 1-5, 8)</b>		
6	9/27	M	One-sample <i>t</i> -test	Ch. 7	
	9/29	W	Paired-samples <i>t</i> -test	Ch. 7	
	10/1	F	<i>Lab</i>		
7	10/4	M	Independent samples <i>t</i> -tests	Ch. 7	
	10/6	W	One-way analysis of variance	Ch. 11	
	10/8	F	<i>Lab</i>		
8	10/11	M	<b>October Break (no class)</b>		
	10/13	W	One-way analysis of variance	Ch. 11	<b>Exercise 3 (Ch. 7)</b>
	10/15	F	<i>Lab</i>		
9	10/18	M	Multiple comparisons	Ch. 12	
	10/20	W	Review		<b>Exercise 4 (Ch. 11-12)</b>
	10/22	F	<b>Exam 2 (Ch. 7, 11, 12)</b>		
10	10/25	M	Factorial analysis of variance	Ch. 13	
	10/27	W	Interactions	Ch. 13	
	10/29	F	<i>Lab</i>		

11	11/1	M	Simple effects	Ch. 13	<b>Exercise 5 (Ch. 13a)</b>
	11/3	W	Higher-order factorial designs	Ch. 13	
	11/5	F	<i>Lab</i>		
12	11/8	M	Analysis of covariance and advanced topics	Ch. 16	<b>Exercise 6 (Ch. 13b)</b>
	11/10	W	Analysis of covariance and advanced topics	Crossman	
	11/12	F	<i>Lab</i>		
13	11/15	M	Repeated-measures analysis of variance	Ch. 14	<b>Exercise 7 (Ch. 16)</b>
	11/17	W	Repeated-measures analysis of variance	Ch. 14	
	11/19	F	<i>Lab</i>		
14	11/22	M	Repeated-measures analysis of variance	Vella	<b>Final Paper Proposal</b>
	11/24	W	<b>Thanksgiving Break (no class)</b>		
	11/26	F	<b>Thanksgiving Break (no class)</b>		
15	11/29	M	Contemporary issues	Open Science, Simmons, Shrout	<b>Exercise 8 (Ch. 14)</b>
	12/1	W	Review		
	12/3	F	<b>Exam 3 (Ch. 13, 14, 16)</b>		
16	12/6	M	Final Presentations		
	12/8	W	Final Presentations		
	12/10	F	Conclusions		
17	TBA		<b>Final Project Due 11:59 pm</b>		