
PSY 2510: STATISTICS IN PSYCHOLOGY

WINTER 2018: MCGINNIS

General Information

Instructor	Dr. McGinnis	Office	Pryale 119	CRN	13259
Phone	248-370-2310	Off Hrs	MW 10:45 - 11:45	Class Time	MWF 9:20 - 10:27 AM
Email	mcginnis@oakland.edu (email preferred)		& by appointment	Location	SFH 169

<u>Teaching Assistants</u>	Abigail Woolston Marcey Shehata Adriana Dostine Ashley Borys	awoolston@oakland.edu mmshehata@oakland.edu aedostine@oakland.edu aborys@oakland.edu	<u>Homework & Lab Assistance</u> Lab Times: 10:30 - 1PM MWF <i>check Moodle for updates</i> Lab Attendance: Optional
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Required Textbooks and Course Materials

1. Aron, A. & Aron, E.N. (2013). *Statistics for Psychology, Sixth Edition*. NY: Prentice Hall.
2. SPSS 22+ for Windows (free download - instructions in Moodle)
3. Texas Instruments 30Xa or 30Xa-Solar. Available at Meijer's, Target, and most stores where calculators are sold. Students may NOT use any of the T-80 series graphing calculators for this course.

Course Objectives

Statistical procedures provide the tools for evaluating research hypotheses. In psychological research, the behavior of a group of people or animals (a sample) is transformed into numbers (data). A statistic is computed using this data that indicates whether the researcher's data provides support for the research hypothesis.

The arithmetic computations of statistics will be covered in this course, *necessitating a background in basic math and basic algebra*. The theoretical and interpretational components of psychological statistics also comprise a significant portion of this course. Emphasis will be placed on fostering an understanding of (1) when it is appropriate to use particular statistical procedures; (2) the arithmetic calculation of statistics and the rationale underlying the use of these computations; and (3) the interpretation of the statistical quantities with respect to the specific research hypothesis being examined.

Important concepts and step-by-step examples of statistical computations will be presented in lectures. A primary goal of lab activities is to enhance the meaningfulness and relevance of course material. In addition, students will be introduced to the use of computers to obtain statistics during lab sessions.

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

- Define and comprehend basic statistical concepts (sample, population, levels of measurement, variability, statistical significance, etc.);
- Use both manual computations and SPSS computer software to calculate and interpret descriptive statistics and inferential statistics;
- Understand hypothesis testing procedures (e.g., the null and alternative hypotheses; statistical significance; Type I and Type II errors), and related ideas (e.g., power, effect size);
- Compute effect sizes and evaluate power statistically for various experimental / data scenarios;
- Understand the rationale underlying the manual computations that yield statistics;
- Determine from the characteristics of the data the appropriate statistical procedure to use;
- Interpret statistical outcomes in terms of the investigator's research hypothesis; and
- Understand statistical results in most Psychology journal articles.

Psy 251 Internet Component – Moodle

Documents and other learning materials are available in Moodle – Oakland University's internet course environment. The URL is moodle.oakland.edu. For assistance, refer to the links on the Moodle homepage.

Homework: Practice Problems

A list of practice problems is available in Moodle. These problems provide students with an opportunity to engage in thinking about statistical concepts and to practice computations. Students should plan on spending 4–8 hours a week doing these problems. Because students who fail to stay current with homework assignments rarely pass, every student is encouraged to be diligent about completing these assignments. Students are encouraged to solicit assistance and/or clarification about practice problems from the instructor during office hours whenever necessary, and are encouraged to do so prior to homework problem due dates. In addition, students are encouraged to keep **photocopies** of all homework submitted so that it will be available for test preparation. Some homework problems must be done in SPSS as well as manually, and this is indicated in the homework document. Attach your SPSS printout with your name printed on it, and answer all of the questions presented. In addition, indicate in writing what the SPSS output indicates and how it corresponds to the statistical procedure under consideration (annotation). Photocopies of SPSS printouts will not be accepted – only original printouts.

To earn high marks all verbal responses should be as clear as possible and all problems requiring computations must show each computational step. All computations must be done using definitional formulas rather than computational formulas, and using sample formulas rather than population formulas (e.g., $n-1$ in the denominator for SD), unless instructed otherwise. Definitional formulas are provided with this syllabus, in the textbook, and in the PowerPoint Lecture Outline Slides. These formulas promote the greatest understanding of statistical computations and conceptual underpinnings. Homework completed using formulas from other textbooks or courses is not acceptable.

Submission of Homework and Grading. Students may choose to use the last four digits of their OU ID number if they are concerned about privacy issues. Otherwise, please put your full name on each homework assignment. Stapling loose pages is required. *Please purchase a stapler at a dollar store.* Graders are not responsible for lost sheets of homework, and may deduct points for loose or missing submissions. Each homework assignment will be graded on a scale of 0–100.

Homework must be turned in by the due date. Homework and labs received more than one class session late will be marked down 50%. Homework and labs that are more than two class sessions late will not be accepted unless the student meets with the instructor during office hours to discuss circumstances. Homework and labs will not be accepted if submitted after the revised date, if the submission date is revised. All of these policies are strictly enforced.

Lab Assignments: SPSS

Lab assignments that require the use of SPSS statistical software are a required component of this statistics course and are downloadable from Moodle. These assignments are designed (a) to highlight and emphasize concepts discussed in lecture and (b) to introduce students to the ways that computers are used by researchers for statistical analyses. Students should plan on devoting about 6 hours each week to lab assignments. SPSS photocopies will not be accepted. Written responses to lab questions must be ***thorough and detailed – illustrating comprehension.***

Annotations. To earn full credit, submitted SPSS print-outs MUST BE thoroughly annotated. Annotations should include information about the formula used by SPSS and information specific to the conceptual aspects of each analysis. An example of annotation will be provided in class and posted in Moodle.

Submission of Homework and Grading. See above for submission information.

Labs must be turned in by the due date. Like homework (see above), labs received more than one class session late will be marked down 50%. Labs will not be accepted if they are more than two class sessions late.

Examinations

There will be 3 exams and a final. Each exam will consist of several short essay and computation problems and 20–60 multiple-choice questions. Students will need a parscore exam form, sheets of blank paper, and #2 pencils on exam days. Make-up exams. Make-up exams will be given only if circumstances outside of the student's control exist, can be documented, and are discussed with the instructor prior to 24 hours post exam time. Students are required to take all make-up exams during *regularly scheduled office hours*, and must do so within one week of the missed exam (the earlier the better). To maintain the integrity of the testing and grading processes for all students, students taking make-up exams after the in-class exams may receive an alternative exam. Students are encouraged to discuss their circumstances with the instructor as soon as possible, enabling appropriate and ethical make-up arrangements.

Student-Professor Meetings

I encourage students to meet with me during office hours and/or other times that we are able to schedule. If you have any questions about your progress, assignment or exam grades, or other issues related to this course, please bring these to my attention as soon as possible.

Composition of Course Grade

Exam I–III (15% each)	45%
Final Exam	19%
Homework	18%
Lab / Comp Assignments	18%

Policies, Guidelines, and Recommendations

Attendance. Poor attendance is rarely associated with a passing grade in this course. Students are urged to attend each lecture. Lab attendance is optional, but it facilitates successful completion of homework and lab assignments for some students. In-class attendance will be recorded via Moodle.

Please Stay Current. Students who get behind in course requirements typically have an extremely difficult time catching up. Students who fall hopelessly behind find themselves failing, and, consequently, having to repeat statistics. Please avoid this – nobody wants to take this course twice or three times.

Due Dates. Students are urged to turn in all assignments (homework and labs) by their due dates. Please refer to homework and lab assignment submission policies. If circumstances beyond the student's control prevent timely submission of assignments, students should discuss these circumstances with the instructor during office hours as soon as possible. Hard copies only – digital submissions will not be accepted.

Make-up exams. Make-up exams will be given only if circumstances outside of the student's control exist, can be documented, and are discussed with the instructor prior to 24 hours post exam time. Students are required to take all make-up exams during regularly scheduled office hours, and must do so within one week of the missed exam. To maintain the integrity of the testing and grading processes for all students, students taking make-up exams after the in-class exams may receive an alternative exam. Students are encouraged to discuss exam-related circumstances asap, enabling appropriate make-up arrangements.

Mobile Phone and Laptop Policy. In the past, non-course related mobile phone or laptop use has been correlated with poor grades in this course. Students using laptops must sit in the front row of the classroom, discouraging the use of laptops for non-course activities during class time. Students must remove mobile phones from desk or table spaces during class. Students requiring monitoring of outside situations must discuss that with the professor and a suitable way to manage phone use during class will be devised.

Math Anxiety. Students having math or test anxiety are urged to visit the instructor as early as possible for help that is specific to their needs. In previous semesters, students with extreme forms of math anxiety have overcome this and not only have they passed statistics but they have earned As and Bs.

Audio Recording Policies. Students who wish to audio-record lectures may request permission to do so. These recordings may only be used for the purpose of personal study. Students may not share these recordings with other individuals without the consent of the professor. At the conclusion of the semester, students may request permission to keep these recordings if needed, otherwise it is expected that all audio-recordings will be deleted from all electronic recording and storage devices.

Assistance. For computational and conceptual assistance, please try to attend one of the lab sessions. These sessions are provided so that students are able to obtain substantial assistance when needed. Please visit the instructor during office hours if you have questions about anything related to this course.

Special Considerations. Students with disabilities who may require special considerations should make an appointment with Disability Support Services (DSS) to discuss these considerations. After meeting with DSS, students must provide relevant documentation to the instructor as early in the semester as possible. Note takers will be available if a student volunteers. If note taking is required, both students are required to sit in the first or second row, ensuring class participation and attentiveness. Scheduling of 1.5x or 2x exam appointments require coordination with the professor's schedule, necessitating student flexibility.

Guidelines for Pryale Hall Use by Students. Because faculty and staff are engaged in a variety of endeavors necessitating a quiet environment (e.g., reading, research, mentoring, administrative, and clerical), teaching assistants and students must work quietly in all rooms and lounges in Pryale Hall. If a faculty member or staff makes a request for quieter discussions, students should acknowledge this request respectfully, and, make efforts to work quietly. Students should consider moving to the OC or the library to continue their work if there is a lot of discussion. If a second request is made, students must take their study session outside of Pryale. The computer lab times associated with this course are for working on SPSS assignments and for obtaining assistance with SPSS assignments. Students are asked to leave the chairs and seating arrangements as they are when working on homework or for group work.

Academic Honesty. Unfortunately, incidents of cheating and plagiarism have been prevalent on college campuses in recent times. In this course, cheating would consist of copying another students' exam, homework, or lab assignment. In order to maximize academic equity and probity, the work that you submit must be your work entirely. In addition, you must not allow other students to look at or copy your work. Please review Oakland University's Academic Conduct Policies included in the Oakland University Student Handbook. A student found responsible for academic misconduct associated with cheating or plagiarism will receive a 0.0 in the courses in addition to sanctions recommended by the Academic Conduct Committee and/or Dean of Students. Dean of Students

Faculty Feedback. As a student in this class, you may receive "Faculty Feedback" in your OU e-mail if your professor identifies areas of concern that may impede your success in the class. Faculty Feedback typically occurs during weeks 2-5 of the Fall and Winter terms, but may also be given later in the semester and more than once a semester. A "Faculty Feedback" e-mail will specify the area(s) of concern and recommend action(s) you should take. I encourage students to discuss this feedback with me as soon as possible, facilitating successful completion of the course.

Student-Professor Meetings. I encourage students to meet with me during office hours and/or other times that we are able to schedule. If you have any questions about your progress, assignment or exam grades, or other issues related to this course, please bring these to my attention as soon as possible.

Departmental Policy for Resolution of Student Academic-Related Concerns. The student has an obligation to attempt to resolve all academic-related concerns with the instructor. If a suitable resolution cannot be reached, then the student should consult the Department of Psychology Procedure for the Resolution of Student Academic-Related Concerns: goo.gl/yGQRbf

Oakland University Add, Drop & Incomplete Policies. Students are urged to review the Adds, Drops, & Withdrawals Procedures and deadlines in the Schedule of Classes as these will be explicitly followed. Timelines and deadlines are available in Moodle and on the OU website. Please review these.

Veteran Support Services. The office of Veteran Support Services (VSS) is responsible for giving support services to more than 300 veterans, service members, and dependents of veterans. Any student veteran or dependent of a veteran requiring assistance with navigating the Veterans Administration, understanding service-related benefits, or requires referrals to campus and community resources should contact one of the Veterans Liaisons by visiting 116 North Foundation Hall, or phoning 248-370-2010. <http://www.oakland.edu/veterans/>

CLASS SCHEDULE

DATE	TOPIC	READINGS
1-3	Introduction to Statistics: Concepts, Manual Computations, and Software (SPSS)	SP 1
1-5 & 1-8	Levels of Measurement & Frequency Distributions	SP 1
1-10	Descriptive Statistics: mean, variance, standard deviation <i>1-5: Lab 1(Intro to SPSS)</i>	SP 2
1-12 & 1-17	Inferential Statistics: Z-scores, normal curve, probabilities, populations, samples. <i>1-12: Chp 1 Hwk</i> <i>1-17: Chp 2 Hwk</i>	SP 3
1-19 & 1-22	Hypothesis Testing I (Core Logic) <i>1-22: Chp 3 Hwk</i>	SP 4
1-24 & 1-26	Hypothesis Testing II (Sample Means) <i>1-24: Lab 2 (Descriptives & z-scores)</i> <i>1-26: Lab 3 (Normal & Standard Normal Distributions)</i>	SP 5
1-29	Review <i>1-29: Chp 5 Hwk</i>	
1-31 & 2-2	Exam #1	SP 1-5
2-5 & 2-7	Understanding Statistical Significance: Effect Size, Decision Error, & Power	SP 6
2-9 & 2-12	Introduction to the t-test & t-test for Dependent Groups <i>2-9: Chp 6 Hwk</i>	SP 7
2-14 & 2-16	Independent Groups t-test <i>2-14: Lab 4 (Dependent Groups t-test)</i> <i>2-16: Chp 7 Hwk</i>	SP 8
2-26 & 2-28	Review <i>2-26: Lab 5 (Independent Groups t-test)</i> <i>2-26: Chp 8 Hwk</i>	
3-2 & 3-5	Exam #2	SP 6-8
3-7 to 3-12	Introduction to the Analysis of Variance Structural Approach to Analysis of Variance <i>3-12: Lab 6 (Analysis of Variance)</i>	SP 9
3-14 & 3-16	Factorial Analysis of Variance <i>3-14: Chp 9 Hwk</i>	SP 10
3-19	Chi-Square Tests <i>3-19: Chp 10 Hwk</i>	SP 13
3-21 & 3-23	Review <i>3-21: Chp 13 Hwk</i>	
3-26 & 3-28	Exam #3	SP 9-10, 13
3-30 & 4-2	Correlation	SP 11
4-4 & 4-6	Regression, SS-Error, R ² , & Multiple Regression (Prediction) <i>4-4: Chp 11 Hwk</i>	SP 12
4-9	General Linear Model: Integration of Statistical Concepts <i>4-9: Lab 7 (Correlation & Regression)</i>	SP 15
4-11 to 4-16	Review <i>4-11: Chp 12 Hwk</i> <i>4-16: Lab 8 (Data Analysis) (2nd due date = 4-23)</i>	
Wed 4-25	Final Exam (Comprehensive): 8:00 - 11:00 AM	Entire Course

SP = Aron, Coups & Aron, *Statistics for Psychology*

PSY 251 DEFINITIONAL EQUATIONS

Standard Deviation

$$SD = \sqrt{SD^2} = \sqrt{\frac{SS}{n-1}} = \sqrt{\frac{\sum (X - M_x)^2}{n-1}}$$

Z-Scores

$$z = \frac{X - M_x}{sd} \quad X = M_x + (z * sd)$$

Independent Groups t-test

$$SE_{Diff} = \sqrt{\frac{sd_1^2 + sd_2^2}{n_1}} \quad t_{obt} = \frac{M_1 - M_2}{SE_{Diff}} \quad d = \frac{M_1 - M_2}{sd_{Pooled}} \quad SD_{Pooled} = \sqrt{\frac{SD_1^2 + SD_2^2}{2}}$$

Dependent t-test / Within- Subjects

$$SE_{Diff} = \frac{sd_{Diff}}{\sqrt{n_1}} \quad t_{Diff} = \frac{M_{Diff}}{SE_{Diff}} \quad df = n - 1 \quad d = \frac{M_1 - M_2}{sd_{Diff}}$$

One-way ANOVA

$$SSB = \sum (M_1 - GM)^2 = n_1(M_1 - GM)^2 + n_2(M_2 - GM)^2 + \dots$$

$$SSW = \sum (X - M_k)^2 = SS_1 + SS_2 + \dots + SS_k = df_1(sd_1^2) + df_2(sd_2^2) + \dots$$

$$MSB = \frac{SSB}{dfb} \quad MSW = \frac{SSW}{dfw} \quad F_{OBT} = \frac{MSB}{MSW}$$

Factorial ANOVA

STRUCTURAL APPROACH : $SS_{Total} = \sum (X - GM)^2$ $SS_{Within} = \sum (X - M_{Cell})^2$

$$SS_{Row} = \sum (M_{Row} - GM)^2 \quad SS_{Col} = \sum (M_{Col} - GM)^2 \quad SS_{Int} = SST - (SSR + SSC + SSW)$$

Shortcuts : $SS_{Total} = (df_{tot})sd_{Grand}^2$ $SS_{Within} = df_1(sd_1^2) + df_2(sd_2^2) + \dots$

$$SS_{Row} = \sum (M_{Row} - GM)^2 \quad SS_{Col} = \sum (M_{Col} - GM)^2$$

$$df_R = R - 1 \quad df_C = C - 1 \quad df_{Int} = N_{cells} - df_R - df_C - 1 \quad df_W = df_1 + df_2 + df_3 \dots$$

$$MS_R = \frac{SS_{Rows}}{df_{Rows}} \quad MS_C = \frac{SS_{Col}}{df_{Col}} \quad MS_{Int} = \frac{SS_{Int}}{df_{Int}} \quad MS_{Within} = \frac{SS_{Within}}{df_{Within}}$$

$$F_{Row} = \frac{MS_R}{MS_W} \quad F_{Col} = \frac{MS_C}{MS_W} \quad F_{Int} = \frac{MS_{Int}}{MS_W}$$

Correlation

$$r = \frac{\sum Z_x Z_y}{n-1}$$

Chi-Square

$$\chi^2 = \sum \frac{(O - E)^2}{E} \quad fe = \frac{R * C}{N} \quad \phi = \sqrt{\frac{\chi^2}{N}}$$

Regression

$$\hat{Y} = a + bX \quad b = r_{XY} \left(\frac{sd_Y}{sd_X} \right) \quad a = M_Y - bM_X$$

Prop Rd in Error

$$R^2 = \frac{SS_{Total} - SS_{Error}}{SS_{Total}} \quad SS_{Total} = \sum (Y - M_Y)^2$$

$$SS_{Error} = \sum (Y - \hat{Y})^2$$