ADVANCED STATISTICS IN PSYCHOLOGY

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Section PS310-01   **Jordan Hall, Room 296**
Fall, 2015   **Phone: 940-9239**
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I.   Introduction

This course is designed for the serious junior or senior psychology major who is sincerely interested in advanced statistical techniques as applied to contemporary problems of modern scientific psychology. As such, this course is designed to teach many of the concepts needed to understand, conduct, and interpret common statistical procedures and techniques.   The emphasis of this course is on the acquisition of conceptual, rather than procedural, knowledge that can be demonstrated by selecting, applying and interpreting appropriate statistical procedures.

Although this course is designed primarily to teach skills related to using the statistical techniques necessary to conduct behavioral and social science research, students from any field will benefit from a solid background in basic statistical methods. Professionals in almost every field are required to read, interpret, and use research reports. These reports usually rely on statistical analyses to draw conclusions and suggest courses of action. Knowledge of statistics is therefore important to help one understand and interpret these reports. Research, employing statistical analyses, is not only becoming increasingly important in our working life, but is clearly having a greater impact on our everyday lives as well. Everyday in newspapers, magazines and on television, studies are reported and evidence is pointed to that "proves" some relationship or conclusion. Survey results, reported almost daily, "demonstrate" some preference for one view over another. Students who apply themselves to this course will acquire skills that are valuable for critically interpreting such data based conclusions.

The student of this course is assumed to have completed both a basic introductory psychology class (e.g., **PS 101**) and have had completed the research methods and statistics prerequisite sequence (i.e.,, **PS 210 and PS 211**). Although a math course (e.g., MA 105 or MA 106) is not required to take this course, basic math and logic skills are essential. Students should have a good statistics calculator and know how to use it. The university will provide computers and software appropriate for the course. Developing excellent statistical skills can prove valuable for later learning in any area because the methodologies can be applied to practically any field. The student considering graduate training, in most any field, should consider this course (and a good research methods course) invaluable and necessary preparation.

II.   Course Goals and Student Learning Outcomes

As part of the major program in psychology, this course is designed to foster student's abilities in 3 primary areas: gaining mastery level understanding of the core content areas of psychology, (PSY SLO Goal 1) develop skills in the analysis of behavior via scientific inquiry (PSY SLO Goal 2) and to present the results of studies using appropriate statistical language (PSY SLO Goal 3). As we cover the various statistical techniques this semester, our emphasis will always be on developing the skills that are vital to accomplishing these goals. The Data Analysis Projects, described in Section VI, are specifically designed to provide students with

"hands-on" learning opportunities to foster their professional development in these areas. Each class session we will focus on two primary objectives that are essential to the class: Learning to apply course material to improve thinking, problem solving and decisions, and Developing specific skills, competencies and points of view needed by professionals in the field of psychology. The instructor will repeatedly emphasize these goals and objectives of the course to help students extract the important components of this course and how it fits into their overall development as emerging professional in the field.

III.   Required Texts and Other Materials

A.   Required Text: The required text for the class is listed below. This book may be purchased at the university bookstore or from many other sources. The required reading and study material will be from the basic texts listed below. Students are required to purchase this text. The main statistical text was selected because 1) it explains very complicated statistical procedures in a long, but readable way without undo emphasis on statistical formula. 2) it will serve as an excellent reference source for later study and use. 3) The writing style should help make the material more fun and interesting. The statistics package selected, SPSS, is the most widely used advanced statistical analysis program available. The university provides SPSS for both Macintosh and Windows computers in most computer labs on campus. Students may wish to consider licensing their own copy of SPSS for their personal computer.

> Field, Andy (2013). Discovering Statistics Using SPSS (4ᵗ Edition). Los Angeles, CA Sage
>   Publications.

B.   Other Materials: Several other supplementary materials will be used in this course. Most will be provided by the university at no or minimal cost to the student. Others must be acquired from local vendors. First, the student should have access to a good statistical calculator and **BRING IT TO CLASS EVERY DAY**. The student should also purchase ruled **non-spiral** notebook paper for doing homework assignments that will be collected (see Section II). The student should refer to the course main website at http://rpadgett.butler.edu/ps310 for access to materials made available to you be the instructor. The student should also check the textbooks companion website at: http://www.sagepub.com/field4e/main.htm for a variety of helpful examples and data sets that will be used during the semester. The textbook author has also included a complete set of videos that demonstrate much of the material from the text in SPSS as well as explaining sections of SPSS output.

The university will provide the student with access to Macintosh or Window's based computers and software including Microsoft Word®, Excel®, and SPSS® from SPSS Inc. These software packages are all protected by US copyright laws and may not be copied or distributed in anyway. It is a violation of the policies stated in the Butler University Student Handbook to copy these programs. The student is directed to that publication for further information. Many materials for the class will be made available via the course main Web site: http://rpadgett.butler.edu/ps310/. Students should be familiar with how to access information on Butler Universities' Information Technology website regarding access to these programs and the acceptable use policy. http://www.butler.edu/it .

C.   Prerequisite Computer Skills: All students enrolled in this course are expected to have some basic computer skills. The Information Resources Department of Butler University provides free training sessions to all students and these courses should have completed during the student's first year orientation. Students enrolled in this class are expected to have an account on Butler's main academic computer systems. Students should know how to read and

send email messages from their Butler account, access Butler file servers (BUfiles), and a familiarity with the Moodle course management system. In addition students should have a working knowledge of Microsoft Windows® or the Mac OS® operating system. Students should know how to use a Word processor (Microsoft Word® is supported at Butler University) and an Internet Web browser (Internet Explorer® Firefox® Google Chrome® and Safari® are supported at Butler University). **Students without these skills must seek out this training from the Information Resources Department in the first week of the semester**. Much of the course content and many assignments require these skills and it is not the purpose or goal of this course to provide such introductory training.

IV. Course Requirements

A. Reading and Study Assignments: Assignments are from the basic text, the SPSS tutorial and other sources. An overview of the assignments is presented in Section IV of this syllabus. Specific weekly assignments are listed on the course Web site. It is the student's responsibility to adhere to the prescribed assignments. The most serious error a student can make in this course is to not meet these assignments on a regular basis. This means not only reading, but also studying and assimilating the material to the point of thorough understanding. **Statistics can be tedious and complicated. It cannot be learned well in two or three bursts of work during the semester**. In addition, learning to use a new statistical analysis system is complicated and time consuming. **Students are expected to spend considerable time learning to use SPSS in the first few weeks of the class**.

B. Examinations: There will be two examinations during the 16-week session. Because a thorough understanding of psychological statistics requires the integration of many component parts, a comprehensive final exam will be given. The exams will be divided into two parts. Part I is always closed book and composed primarily of objective (multiple choice) type questions. Part II is open book and will consist primarily of short answer and computational type items. Expect in class exams to take 2 hours. Students are expected to bring a no. 2 pencil to all examination sessions. Exams will be given on the dates specified in Section IV of this syllabus. Take-home exams, if employed, will be due as specified on the exam and must be checked in by the instructor, or at his direction, the department secretary. **No take-home exams may be turned in when the instructor is unavailable**.

C. Homework: Statistics is learned best by doing, not by just reading. **YOU ARE EXPECTED TO DO EVERY HOMEWORK PROBLEM BY ITS ASSIGNED DATES**. Homework assignments will be given on the first class meeting of each week and are due the following week. Problems are drawn from the basic text, and other sources. Homework assignments are listed week by week on the course Web site. Students are encouraged to do as much homework as possible using SPSS. Homework problems should be answered on your own plain ruled standard letter size paper (**NO SPIRAL TEAR-OUTS**). The work must be neat and easy to read, with answers clearly labeled and all pages stapled together. Your name should appear on the **top right hand corner of every page**. Homework assignments will be collected in their entirety. Any assignment that is not complete or does not meet the requirements and standards set above will receive no credit with no opportunity for resubmission.

At **random intervals**, homework problems will be collected at the **BEGINNING OF THE CLASS** without discussion. HAVE ALL COMPLETED HOMEWORK BOTH PAST AND CURRENT WITH YOU AT EVERY CLASS SESSION. Students who fail to turn in their assignments on time will receive zero points for that assignment. **LATE HOMEWORK ASSIGNMENTS WILL NOT BE ACCEPTED**. Completed assignments will receive a

maximum of 5 points per assignment. It may not be possible to return all homework for you to use for review. For more information see Section VI of this syllabus.

D. Data Analysis Projects To help the student master the art of statistics, a series of data analysis and interpretation assignments are prescribed. Students are required to complete at least 5 but may complete one additional assignment for credit. Data Analysis Projects must be done in order and must be submitted electronically via the paper submission upload system accessible via the course main web site. Projects may not be submitted via email. **THERE ARE NO SPECIFIC DUE DATES FOR THESE PROJECTS**. However, students must wait one full week (168 hours as dated by the upload system) between submissions. The last date for a submission is based on the last day of instruction for the semester. See Section IV of this syllabus for more information.

These assignments require students to integrate all that they have learned in the class to date to the analysis and interpretation of a data set. The specific assignments and data sets will be made available to the students via the course Web. In these assignments, students are expected to apply the data analysis techniques that they have learned to a data set and write a well-documented response to the questions posed in the problem. Documentation should include printouts of data analyses. **The grading emphasis on these assignments, however, is not on the statistical output from SPSS, but on the student's selection and interpretation of statistical results and what those results indicate about the data**. More complete and well-documented analyses will receive more points. Grading criteria and point totals are specified in Section VIII of this syllabus. Submission format information is specified in Section VI of this syllabus.

Students are expected to do their own work on all Data Analysis Projects. Students are encouraged, however, to help each other on the use the statistical software. The instructor will be available after class and during office hours to help students with the assignments.

E. Weekly Quizzes In order to help students keep up with their reading and study assignments on a regular basis, students will be required to take a series of quizzes that will focus on the material currently assigned in the course. Quizzes will generally occur on the first meeting of the class each week. Quizzes will be given at the beginning of class and students will have 10 minutes to complete the items. The quizzes will generally consist of 10 multiple-choice type items presented on the overhead projector. **NO MAKE-UP QUIZZES** will be given. Students not present for a quiz will receive zero points for that week. See section VII for more information about the grading of quizzes.

F. Class Attendance Class **ATTENDANCE** and **PARTICIPATION** is mandatory if the student is to grasp complex statistical concepts and principles. No more than two absences are expected without SERIOUS GRADE DETERIORATION. For more information see Section VII of this syllabus. **STUDENTS SHOULD BE PREPARED FOR ALL CLASS SESSIONS**. That is, you should have **completed your homework, read the assignment, and have your calculators, books, and papers with you for all class sessions**. Students should be ready to start work immediately at the beginning of class. Students should not be reading newspapers, email, textbooks, materials for other classes, or otherwise occupied during class time. Do not come to class and interfere, hold back, or distract students who come to class prepared to learn. Using your phone and/or computer during class (except where required by the instructor) is extremely distracting to you, other students, and the instructor. Students who disrupt the class in this way will be asked to leave. Continued disruptions will result in grade penalties including up to and including failing the class. **STUDENTS USING THE COMPUTERS DURING CLASS TIME FOR ANYTHING OTHER THAN PS-310**

MATERIAL AS ASSIGNED BY THE INSTRUCTOR WILL BE TOLD TO LEAVE THE ROOM. Do not come to class and interfere, hold back, or distract students who come to class prepared to learn. **PLEASE TURN OFF ALL CELL PHONES BEFORE THE START OF CLASS**. **NO MAKE-UP EXAMINATIONS** are allowed. If you are unable to attend a scheduled examination, appropriate arrangements must be made with the instructor **IN ADVANCE**.

G. Contact the Instructor The student is encouraged to seek help whenever he/she runs into problems with this course. For help over and beyond in class questions, get an appointment with the instructor. The instructor can be reached at his office in the Psychology Department, JH 296, by phone at 940-9239 or by email at: rpadgett@butler.edu. **IMPORTANT NOTICE: Students contacting the instructor by email regarding any Butler related activity MUST send their email from their Butler University assigned email account. The instructor does not read or respond to emails from other sources**.

V. Course Schedule and Reading Assignments

Below is a brief course outline. The complete week-by-week assignment list can be found on the course web site.

Week	Date	Discussion Topic	Assignments/Readings
1	31-Aug	Introduction Levels of Measurement Basic Statistics Review SPSS Introduction	Chapters 1,2,3.
2	7-Sep	Descriptive Statistics Using Graphs	Chapters 4
3	14-Sep	Correlation and Association	Chapter 7
4	21-Sep	Linear Regression I	Chapter 8
5	28-Sep	Part and Partial Correlation	Chapter 8
6	5-Oct	Linear Regression II Multiple Regression	Chapter 10
7	12-Oct	Mediation and Moderation Testing One and Two means	Chapter 9
8	19-Oct	Catch-up and Review **Mid-Term Exam**	
9	26-Oct	Comparing Several Means	Chapter 11
10	2-Nov	Incorporating a Covariate	Chapter 12
11	9-Nov	Repeated Measures Designs	Chapter 13
12	16-Nov	Factorial ANOVA	Chapter 12
13	23-Nov	Thanksgiving Break	
14	30-Nov	Testing Categorical Data	Chapter 18
15	7-Dec	Non-parametric Tests	Chapter 15

16	14-Dec	**Final Exam** **Wed, Dec 16, 8:00-10:00 AM**	**Last Project Submission:** **Mon, Dec 14, 11:59 pm**

VI.   Data Analysis Projects

The Data Analysis Projects are described in Section III of this syllabus. The student will find doing these projects very interesting and integrative of what she/he has learned if she/he starts on them early and puts considerable effort and serious thought into them relative to the material covered in the course. The format and submission requirements of these reports are defined below:

A.   Format: All project reports must be type using Microsoft Word® on a Macintosh or Windows computer. Other word processing programs must be able to save documents in this format. The data analysis work should be done in the provided statistics package (SPSS version 18 or later) or other if preferred and if approved by the instructor. Selected computer output, if included, must be pasted into the one Word document to be submitted online. All work to be submitted must be in one document unless actual computer output is requested by the instructor. **Students should save backup copies of their work**.

B.   References: All sources used must be appropriately referenced. Outside references should be referenced as specified in the *Publication Manual*. Work presented as part of a Data Analysis project must represent the student's own work. It is the student's responsibility to be familiar with the university's policy on Academic integrity as it will be **STRICTLY ENFORCED** (https://www.butler.edu/student-handbook/academic-integrity). In such cases, the instructor will file a report in the student's record with the Dean of Student Affairs and reserves the right to impose grade penalties, including failing a student in the course, for any violation of the policy.

C.   Submission Requirements: Data analysis projects must be submitted via the online project submission system. Details of how to use this system are available on the course main web site. **Because technology can occasionally fail, students are expected to keep a copy of their papers for their records.** Any written work submitted by an enrolled student in fulfillment of a course requirement is subject to review for possible copyright violation and plagiarism. The instructor reserves the right to submit all student work to any and all Internet databases (e.g., TurnitIn.com) for review and such work maybe added to their databases for future comparison to other submitted work. A student's enrollment in the class signifies their agreement to these terms and conditions.

D.   Grading: Students will receive an evaluation score and brief comments electronically when the project has been graded. As specified in Section VII below, the 5 mandatory Data Analysis Projects are worth 25 points each. Students who receive a score lower than 16 points may be asked to redo the assignment. Students should discuss their Data Analysis Project results with the instructor before attempting to resubmit them. Students may receive up to 10 points (for a maximum total of 125 points on the Data Analysis Projects) for successful completion of the sixth Data Analysis Project.

VII.   Optional Research Participation

All students enrolled in this course may gain extra bonus credit toward their final grade through experimental participation opportunities, if and as they become **AVAILABLE** during the term of enrollment. There are several ends to be gained by experimental participation:

    1)   It gives the student an opportunity to view on-going research to learn more about the nature of psychological research.

    2)   Learning more about conducting research may motivate the student to conduct their own research at a later date.

    3)   The student will be contributing her/his part to the advancement of scientific knowledge in this field.

If Psychology Department approved research is scheduled during your enrollment in this course, you may earn bonus credit for participating. Students who wish to participate in any extra credit opportunities must register for participation on Butler University's Psychology Research Participation System at http://psych-research.butler.edu. This system has a listing of available opportunities and information about how you can participate. You will receive credit **ONLY FOR APPROVED** research projects. The description will briefly outline the participant's task in the research and the amount of time the experiment will take. ***Do not sign up to participate in an experiment unless you really plan to attend.*** Students who fail to show up or do not at least notify their experimenters via the sign-up system IN ADVANCE risk loss of credit. Students may earn 3 bonus points for every hour (maximum of 3) they participate for a total of 2% bonus credit. See Section VII for more information. The system should keep careful track of all studies for which you participated, but students are highly encouraged to keep careful notes about their participation. Computer systems can fail and careful records with ensure your full credit for participation.

VIII. Course Grading

Performance evaluations will be affected by the weekly quizzes, the two exams, the Data Analysis Projects, and the collected homework assignments. A total of 125 points may be earned on the exams. The first exam is worth 75 points each and the comprehensive final is worth 75 points. Students may earn a maximum of 125 points on the Data Analysis Projects. Weekly quizzes will count for a maximum of 10 points each. The collected homework will total a maximum of 25 points divided across the total number of assignments collected.

A maximum of 3 bonus points may be earned for research participation. Class attendance and participation can also have a substantial effect. Students with excessive truancy may have their final grade lowered one letter grade. Final grades in the course will be scaled:

        A = 90% or more of total points
        B = 80% to 89% of total points.
        C = 70% to 79% of total points.
        D = 60% to 69% of total points.
        F = below 60% of total points.

Students in the upper 2% of a range will receive a + added to their final grade while students in the lowest 2% of a range will have a - added to their final grade. For example 88-89.99% is a B+ and 90-91.99% is an A-. Sorry, the university does not utilize the A+ grade. The instructor reserves the right, at his discretion, not to assign the C- grade.

IX. Disclaimer

While every attempt was made to ensure that this syllabus is accurate and complete, some errors or omissions may remain. The instructor reserves the right to make any corrections or adjustments to this syllabus if circumstances dictate its necessity. Any such changes will be announced in class.

X. Copyright Notice