PSYC 605: Intermediate Inferential Statistics Fall 2013

Location: Anthony-Seeger, Room 9
Section 1 (Keston): Tuesday/Thursday 9:30-10:45 a.m.
Section 3 (Jeanne): Tuesday/Thursday 3:30-4:45 p.m.

Instructor (Section 1)

Keston Fulcher, PhD
fulchekh@jmu.edu
540-568-3292
Office: 28 Anthony-Seeger Hall
Office hours: Tuesday 10:45-1 p.m.
or by appointment

Teaching Assistant (both Sections)
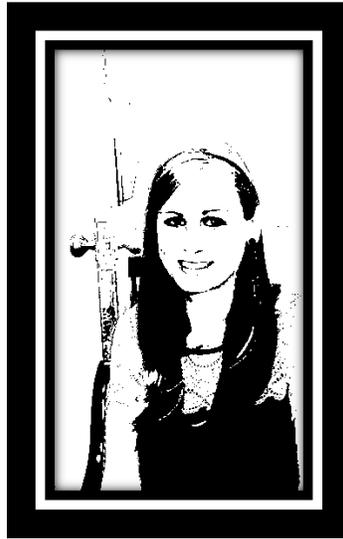
Kristen "Chicken" Smith
smith4kl@jmu.eu
540-568-6451
Office: 14B Anthony-Seeger Hall
Office hours: Thursday 12:30-2:30
p.m.

Instructor (Section 3)

S. Jeanne Horst, PhD
horstsj@jmu.edu
540-568-7103
Office: 16 Anthony-Seeger Hall
Office hours: Monday 10:30-12:30
or by appointment

Course Overview

Why take this course?

- How good does evidence need to be before you adopt/change your position on an issue?
- What assumptions do you make about your evidence?
- What are the threats to the evidence on which you rely?

Students with diverse backgrounds enroll in this course for a multitude of reasons. The commonality is the need to understand statistics. Statistics are not only valuable to researchers, but understanding statistics is extremely useful in today's world. It's hard to imagine someone who isn't impacted by political, medical, or educational decisions that are based on quantitative research. Studying statistics also offers students the opportunity to improve their critical thinking, logical reasoning and problem solving skills. As anyone who has them will tell you, statistical skills are marketable and professionally valuable.

Thus, there are many reasons to "dig in" and devote time and energy to learning statistics this semester. Remembering why you are doing it throughout the course will keep you motivated and make the tasks less tedious.

We encourage all students to write down their personal goals for the course and review them periodically. Specifically, consider these questions: "What do I want to get out of this course? And "How will this course benefit me?" To support student motivation and learning, we will make an effort to remind students of the relevance of the material.

Course Purpose and Objectives/ CACREP Standards

This course is intended to be a second course in statistics. Important foundational topics like hypothesis testing, confidence intervals, effect sizes, correlation, and statistical power will be covered at a deeper conceptual level than in an introductory course. Additionally, more complicated statistical models all associated with the General Linear Model will be introduced. Specifically, this course focuses on analysis of variance (ANOVA) statistical models. After illuminating the mathematical and theoretical details behind the basic ANOVA model, students will learn several common types of ANOVAs that are increasingly complex as the semester progresses.

From a macro-perspective, we would like you to approach quantitative analysis problems like a researcher who would use the following steps:
(A) Clean the data,
(B) Identify an appropriate statistical analysis, given the research question,
(C) Check the assumptions of that analysis,
(D) Run the analysis via statistical software, and
(E) Interpret the results.

The specific student learning objectives of the course are as follows:
- **Explain** the logic underlying statistical hypothesis testing.
- **Explain** the importance of sampling distributions in hypothesis testing.
- **Distinguish** between significance tests and effect sizes.
- **Calculate** and **interpret** Pearson correlation coefficients.
- **Calculate** and **interpret** simple linear regression equations.
- **Explain** the logic underlying analysis of variance.
- **Explain** the statistical assumptions underlying ANOVA and the ANOVA model's robustness to their violation.
- **Distinguish** between planned and post hoc ANOVA comparisons.
- **Construct** a planned comparison and test it for significance.
- **Test** a set of post hoc comparisons for significance.
- **Explain** statistical power and its influences.
- **Conduct** a power analysis for one-factor experimental designs to choose an appropriate sample size.
- **Interpret** interaction effects in factorial ANOVA designs.
- **Perform** tests of simple effects to follow up significant interactions.
- **Identify** an effective blocking variable and analyze the data from a treatments by blocks ANOVA design.
- **Identify** an effective covariate and analyze the data from a one-factor analysis of covariance design.
- **Use SPSS** to analyze data from one- or two-factor ANOVA designs containing between-subjects factors, within-subjects factors, or both.

Students who successfully complete this course will demonstrate knowledge in the following content areas of the CACREP 2009 Standards:

RESEARCH AND SCHOLARSHIP
E. Knowledge

- o   Understands univariate and multivariate research designs and data analysis methods; E.1.

- o   Understands qualitative designs and approaches to qualitative data analysis; E.2.

- o Knows models and methods of instrument design; E.3.

- o Knows models and methods of program evaluation; E.4.

F. Skill/Practices

- o Demonstrates the ability to formulate research questions appropriate for professional research and publication; F.1.

- o Demonstrates the ability to create research designs appropriate to quantitative and qualitative research questions. F.2.

Prerequisites for the Course

Statistics and Research Methods
The class is designed for students who successfully completed a previous course that covered the following topics: measure of central tendency (e.g., mean, median, mode), measures of dispersion (e.g., variance, standard deviation, range, outliers), frequency distributions (e.g., skew, kurtosis), probability, displaying data graphically (e.g., histograms, box plots), the normal curve, hypothesis testing, one-sample t-tests, two-sample t-tests (independent and dependent), independent and dependent variables, categorical and continuous variables, and basic principles of research design and methodology.

Math Skills
Understanding intermediate statistics is largely a conceptual and logical challenge. Even though the statistics we will discuss are intermediate, the math needed to reach understanding of them is still basic. Explicitly, students should be familiar with: order of operations, operations with fractions and positive/negative numbers, solving for a variable using simple algebraic manipulations, the equation of a line, interpreting symbols such as greater than/ less than, absolute value, and square roots. Students are encouraged to consult their previous textbooks, textbooks in the library, or resources widely available on the internet to review these topics.

Course Philosophy

Student Responsibility for Learning
Your effort will be the main determinant of success. Take responsibility for your own learning. This means actively engaging in, spending time with, and thinking hard about the material. Even when conducting group work, be mindful of your own learning and be sure to contribute to the group in order to maximize your learning opportunities. To be successful in this course, an adequately prepared student (i.e., understands basic statistical content) will most likely need to dedicate *at least 6 hours per week* to the course outside of class. Please consider carefully whether you are "up for the challenge" at the outset.

Workload
Our role as instructors is to facilitate your learning of the course material. Intentionally, the workload for this course is not light. We assign frequent assignments and assessments that provide multiple opportunities to engage with the material. The purpose of doing so is to increase the probability that you learn, use, and retain the information.

Expectations for In-Class Behavior
We expect you to come to class prepared, ready to learn, and to conduct yourself in a professional manner. We hope to create a respectful learning environment that is engaging and interactive. The responsibility for creating such a community falls on both the instructors and the students. Specifically, this means doing reading in advance

of class, getting help with troublesome concepts, asking questions, interacting with your peers and instructor during class, and conducting yourself in an appropriate and professional manner.

Preferences for Out-of-Class Communication
The instructors for this course have strategically set up their office hours so that many times are available to students. We recommend that you come to the office during these time frames to make the most efficient use of time. However, all three of us are available beyond office hours for consultation as needed.

How to Be Successful in This Class
- Come to class ready to learn.
- Complete the warm-up exercises *prior to* each class.
- If you become confused or don't fully grasp a concept, ask for help or spend more time on it.
- Spend time studying at the beginning of the semester.
    - If you do this, the second half of the course will be much easier than the first; if you don't the second half could be brutal. Once you get statistics language and the concepts down, you'll be set.
- Use the stated course goals and objectives to guide your study time and check your progress.
- Know what is going on: keep up with email, course announcements, and the course schedule.
- Complete all course assignments by the scheduled due date. Try to apply the information to your area of study.

Anatomy of a Week in This Course

Given our course philosophy, we believe that the time you spend working with statistics concepts *outside of class* is just as important as the time you spend *inside class.* Therefore, we will assign activities and readings for you to complete outside of the classroom. Before every class, you will complete a warm-up exercise on Canvas. Other out-of-class activities will include readings, homework, and occasional video lectures. We expect that you will come to class prepared to engage with the material. Note in the castle-top diagram (Fink, 2003), below, that we will do lectures, demos or group work within the class period. However, outside of class we will expect that you will exerting the effort necessary to master the concepts.

Castle-Top Diagram of a typical week in PSYC 605	**Tuesday In Class** -Clarify warm-up misconceptions. -Lecture, demo, or group work		**Thursday In Class** -Clarify warm-up misconceptions. -Lecture, demo, or group work	
Out of Class -Warm up -Reading -Occasional lecture video		**Out of Class** -Warm-up -Reading -Occasional lecture video		**Out of Class** -Homework -Take-home exams

Course Materials

Textbook: Field, A. (2013). *Discovering statistics using IBM SPSS Statistics.* (4th ed.). Los Angeles, CA: Sage.
We will be reading most chapters in this book. Although it's a thick and heavy book, it is actually light-hearted and friendly inside. To be successful, students will need to read the assigned chapters, or at least browse them to make sure they fully grasp the included content. In addition, Field integrates conceptual explanation of statistical techniques with a how-to-guide for using SPSS. Thus, there is really no need to buy an SPSS manual as it is part of your text! Please ask if you have questions about the text. It is available in the JMU bookstore and online.

Statistical Software
You will need to use a statistical software program to complete some assignments. The textbook covers how to use SPSS to run all of the analyses we will discuss in this class. Most labs on campus have SPSS installed (check this link to see JMU labs: http://www.jmu.edu/computing/labs/locations/).

Canvas Site
Canvas is an online course portal that can be accessed from the JMU home page (www.jmu.edu). We will use Canvas extensively throughout this course. Not only will course materials be provided through this site, but also some assignments will be administered through Canvas. Please let us know if you do not have access to this course through Canvas. (To those of you who may be new to JMU this year, we are in the process of migrating from Blackboard to Canvas this year. For that reason, some instructors may use Blackboard, whereas others will use Canvas.)

Readings (Other than Text)
We will make additional course readings available on Canvas. We will let you know which readings are required for the course, and which readings are available to deepen your learning.

Lectures
We will provide the lecture slides and any other lecture materials on Canvas. There is some course material that is only covered through lecture. Lectures will augment what is covered in the assigned readings and highlight the most challenging concepts. We will not necessarily provide PowerPoint slides prior to class. The available research literature on learning science indicates that providing students word-for-word slides may inhibit in-class learning.

Description of Coursework Components and Grading

Cumulative Take-Home Tests
The tests provide opportunity for you to receive feedback on your effort and learning in the course. The exams are designed to ensure that students have an accurate and complete understanding of the overarching and critical concepts and principles presented in the course. Each test will focus primarily on the material most recently presented. However, given that the material we study in this course builds on itself as we progress, the exams may include statistical concepts covered in prior sections of the course.   In addition, topics that students struggled with on the previous test may be included to ensure mastery of the material. Therefore, it is important that you review feedback from previous tests and make sure you have any questions resolved by the next test. Finally, the take-home exams are to be your work ONLY. If you have questions, direct them towards the instructors or teaching assistant. The exams are our best way of gauging how well you are learning the material. Students typically take anywhere from 10 to 20 hours to complete the tests, so plan accordingly.

Warm-Up Exercises
Complete a warm-up exercise prior to each day's class (will be posted on Canvas). The warm-up exercises will be based on the week's reading and will be an opportunity for you to receive immediate feedback on your understanding of the concepts. The warm-up will also provide a place for you to communicate your "muddiest points" that you would like clarified during class. Students will be graded for completion of the warm-up (points for completion) and the warm-up exercises will remain open for you to review as often as you like after class.

Homework Assignments
The homework assignments provide an opportunity to apply the statistical concepts and techniques we are learning using the SPSS software. In addition, we will incorporate some "deep thought" questions and other exercises in the homework to hone your conceptual understanding. For homework assignments, we encourage students to work together. Nevertheless, each student is responsible for demonstrating that s/he has a good grasp of the material; therefore, _all written work must be your own._

In-Class Activities
We will be sporadically conducting in-class activities throughout the semester. Typically, there will be no grades attached to the activities and the feedback will be formative. However, there are several activities for which we will be rewarding high effort and skill in articulating the statistical concepts that we are covering.

Course Requirement	Grade Percentage
Cumulative take-home tests (2)	40% overall (20% each)
Homework assignments	50% overall
Warm-up exercises/quizzes	10%

Grades will be assigned based upon the following percentages:

A = 94-100	B = 83-86	F = below 70
A- = 90-93	B- = 80-82	
B+ = 87-89	C = 70-79	

Responsibility for Learning and the Honor Code

Being responsible for your own learning does not mean that you must always work in isolation. However, when working in groups we encourage you to be mindful of how much effort and learning you are experiencing. Below we outline our expectations for individual and group work in this course.

Take home tests should be completed by students individually. Questions should be directed only to the teaching assistant or the instructor (do not consult other students or any other person.)
For homework assignments, we encourage students to work together. Nevertheless, each student is responsible for demonstrating he or she has a good grasp of the material. Ultimately, the homework should reflect your own work and learning.

Outside of extenuating circumstances the penalty for submitting assignments late is 10 percentage points per school day. For example, if an assignment is due on Tuesday and student X submits it on Friday then 30 percentage points will be deducted from the score. A 92 would become a 62. As such it would behoove you to turn in assignments in a timely manner. Plan accordingly.

For all work we do in this course, the JMU Honor Code is in effect! Cheating and plagiarism will NOT be tolerated. Any and all violations will be referred to the Honor Council for disposition (really!). See http://www.jmu.edu/honor for information about the Honor Council and the Honor Code at JMU.

As a professional, you will have every opportunity to behave in a non-ethical manner. We hope to provide the context and support so that you can develop your statistical skills in conjunction with ethical, professional behavior. Although the chances of getting caught in an ethics violation may be small (e.g., no journal has ever asked either instructor for our data so that they could double-check the data analyses reported in a paper), the consequences are severe. If you are struggling with ethical decisions that confront you, or you see others around you struggling, please feel free to consult with either instructor as you work through these issues. Without credibility, any statistical analysis, assessment, or conclusion is on very shaky ground, indeed!

General statement from JMU
"Making references to the work of others strengthens your own work by granting you greater authority and by showing that you are part of a discussion located within an intellectual community. When you make references to the ideas of others, it is essential to provide proper attribution and citation. Failing to do so is considered academically dishonest, as is copying or paraphrasing someone else's work. The results of such behavior will lead to consequences ranging from failure on an assignment to failure in the course to dismissal from the university. Please ask if you are in doubt about the use of a citation. Honest mistakes can always be corrected or prevented.

Academic dishonesty is not limited to plagiarism. Other examples of academic dishonesty include cheating on tests or homework, taking an exam or writing a paper for someone else, and selling or uploading unauthorized documents from a class."

Additional Information

Adding/Dropping Classes: As mature and conscientious students, you know that you are responsible for registering for classes and for verifying your class schedules on e-campus. Obviously, you must register for classes or drop classes before the scheduled add/drop deadline. For more details, you can refer to the Registrar's Web site at http://www.jmu.edu/registrar/.

Academic Integrity: It should come as no surprise that we expect you to be committed to academic honesty, which is absolutely essential for the success of any learning community, but especially one with the mission of training ethical counselors. If you are unfamiliar with the specifics of the JMU Honor Code, you can read it at http://www.jmu.edu/honor/code.shtml#TheHonorCode.

Inclement Weather: Inclement weather may lead to the cancellation of a class. If you are unsure of the weather conditions on campus, you can call the JMU Weather Line at 540.433.5300. You also can listen to the JMU radio station at 1610AM for cancellation announcements. The area radio and television stations regularly inform the public when classes are cancelled. For details about JMU's cancellation policy, go to http://www.jmu.edu/JMUpolicy/1309.shtml.

Disability Accommodations: JMU abides by Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act, which mandate reasonable accommodations be provided for students with documented disabilities. If you have a disability and may require some type of instructional and/or examination accommodations, please contact me early in the semester so that I can provide or facilitate provision of accommodations you may need. If you have not already done so, you will need to register with the Office of Disability Services, the designated office on campus to provide services for students with disabilities. The office is located in Wilson Hall, Room 107; you may call 540-568-6705 for more information.

Religious Accommodations: Reasonable and appropriate accommodations will be provided to students requesting them on grounds of religious observation. As the instructor, I will determine what accommodations are appropriate for his/her course. Students should notify me by no later than the end of the Drop-Add period the first week of the semester of potential scheduled absences and determine with the instructor if mutually acceptable alternative methods exist for completing the missed classroom time, lab or activity. Contact the Office of Equal Opportunity (http://www.jmu.edu/oeo/) at (540) 568-6991if you have additional questions.

Confidentiality and Title IX: Title IX addresses not only gender discrimination, but also sexual harassment and sexual violence, because they create a hostile educational environment. We are committed to creating a safe haven and an open atmosphere in this learning community. The personal information you share in your written assignments, class discussions, experiential activities, and counseling practice sessions enriches the learning experience for everyone. We want to let you know that, as educators, we are mandated by Title IX to report any suspected sexual harassment or sexual assaults of students. This mandate does not require identifying you and we are dedicated to addressing these concerns with sensitivity and consideration for your privacy and wellbeing. If you do want to report any event, the contact person is James Robinson, director of the JMU Office of Equal Opportunity, at http://www.jmu.edu/oeo/. Furthermore, we also will take necessary action to respond to any disclosures of dangerousness to self or others. For more information, go to http://knowyourix.org/title-ix/title-ix-in-detail/

Attendance
JMU Policy: "A student's participation in the work of a course is clearly a precondition to his/her receiving credit in that course. Because of the wide variety of courses and teaching methods at JMU, the university recognizes that the

nature of a student's participation in the work of a course cannot be prescribed on a university-wide basis. For this reason, classroom attendance is not a matter subject to regulation by the university. Attendance in class and in the laboratory is a matter between the student and the faculty member in that class or laboratory. The attendance policy for specific courses is provided by the class instructor."

Specific to this Course:
Although I do not record your attendance, I do expect that you will attend class. If you need to miss a class it is your responsibility to gather the material covered in that class period from your classmates. I will not hold a private class or tutoring session in my office. There will be no "make-up" activities if you didn't attend class the day an activity.

Tentative Course Schedule				
605 Calendar		**Topic**	**Reading***	**Homework & Exams****
Week 1	**Aug. 27**	Section 1: Introduction to Research Design, Inferential Stats and SPSS (2nd half of Thursday in computer lab)	Field Chapter 1	
	Aug. 29			
Week 2	**Sept. 3**	Section 1: Continued	Field Chapter 2	
	Sept. 5			
Week 3	**Sept. 10**	Section 2: Correlation and Regression	Field 7	**Homework #1**
	Sept. 12		Field 8.1-8.4.4	Descriptive Stats
				Due Friday @ noon, 9/13
Week 4	**Sept. 17**	Section 3: T-tests	Chapter 9	**Homework #2**
	Sept. 19			Correlation and Regression
				Due Friday @ noon, 9/20
Week 5	**Sept. 24**	Section 4: Power, Effect Sizes, and Confidence Intervals	Review pp. 69-84	**Homework #3**
	Sept. 26			Independent Samples t-test
				Due Friday @ noon, 9/27
Week 6	**Oct. 1**	Section 5: One-way ANOVA	Field 11	
	Oct. 3			
Week 7	**Oct. 8**	One-way ANOVA, contd.	Field 11	**Homework #4**
	Oct. 10			One-Way ANOVA
				Due Friday @ noon, 10/11
Week 8	**Oct. 15**	Section 6: Factorial ANOVA	Field 13	**Homework #5**
	Oct. 17			One-Way ANOVA follow-ups
				Due Friday @ noon, 10/18
Week 9	**Oct. 22**	Factorial ANOVA, contd.	Field 13	**Take-Home Exam**
	Oct. 24	**NERA**		Due
				Friday noon, 10/25
Week 10	**Oct. 29**	Section 7: ANCOVA	Field 12	**Homework #6**

				Factorial ANOVA & follow-ups
	Oct. 31			
				Due Friday @ noon, 11/1
Week 11	**Nov. 5**	Section 8: Within-Subjects One-Way ANOVA	Field 14	
	Nov. 7			
Week 12	**Nov. 12**	Section 9: Within Subjects Factorial ANOVA	Field 14	**Homework #7**
	Nov. 14			Within-Subjects ANOVA
				Due Friday @ noon, 11/15
Week 13	**Nov. 19**	Section 10: Mixed ANOVA	Field 15	
	Nov. 21			
Week 14	**Nov. 26**	**Thanksgiving Break**		
	Nov. 28			
Week 15	**Dec. 3**	Section 11: Ethics, advanced statistics, wrap up		**Homework #8**
	Dec. 5			Mixed ANOVA
				Due Friday @ noon, 12/6
Week 16		**Finals Week**		**Take-Home Exam**
				Due 5 p.m., 12/10

*Additional, supplemental readings will be assigned throughout the semester.

Supplemental readings will be posted on Canvas.

**In addition, daily warm-ups and occasional lecture videos will be assigned.