

Course: 07.701 Seminar in Data Analysis

Time: Thursday 4:00 to 6:30 Room: As assigned

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Office Hours: Tues, Thurs, 2:15-3:45, and by appointment and e-mail.

Summary of the Course

The primary focus of this course will be on conceptual understanding and interpretation of quantitative, statistical, and empirical ideas, concepts, methods, indices, and tests, and the appropriate usage of various statistics and statistical tests. Actual computation and data analysis will be required, but the focus will be on quantitative, statistical, and empirical thinking, reasoning, and understanding as opposed to "number crunching" and "algorithmic, procedural and do it by the numbers" approaches to statistics, statistical analyses, and statistical understanding (i.e., "math computation" solely). Simply running some data (numbers) through some formula and saying 'significant or not significant' is and will not be enough in this course, as you have to read and interpret the statistics and statistical work of others, as well as do your own statistics and statistical work properly.

Understanding statistics and the methodologies that produce them is a basic literacy in today's world and a basic professional literacy. Becoming statistically and research literate relative to understanding and interpreting statistics and research methodologies is the bottom-line standard in this course. So telling me that you know how to compute a mean or a correlation, but you do not know how to interpret it, is neither acceptable nor meeting the bottom-line standard of the course. **An analysis (or statistical computation) is not complete or done until a full interpretation of the results is done. Data decides nothing: people using valid data that is properly and meaningful analyzed and interpreted make decisions (decide) about some point of interest using explicit criteria, theories, and values.** So be clear, the focus is on you and your interpretation of the results obtained and your decision-making. **Computation is not is enough.**

Weekly reading, thinking and analysis (computation/interpretation) assignments will be given. Additional practice exercises and materials will be distributed at various points in the semester, including an individual and group data analysis project. Some exposure to computers to do various computations and analyses will also be part of the course. However, a hand calculator with working batteries (particularly for class and tests) is more than recommended. Class attendance is not required. Class is a learning resource for you to use and manage as adult learners. **But if you come to class, please come to class prepared having done the assigned readings and exercise (see statement of course Ground Rules for details).**

Assessment and Grading

There will be 3 main quizzes during the course (see syllabus for dates). Quizzes will be done in class by each person individually without use of notes or texts. The quizzes will have multiple choice, short answer, and short computational items. The items on the quizzes will be at all levels of Bloom's taxonomy but mostly at the knowledge, comprehension and application levels. **You may look up any formula you need to do a test item (or have it on a index card to use), but that is all,** just the formula, no notes or reading the text around it. The quizzes will be corrected in class so that you can review and study and learn from your mistakes and errors. The content on the quizzes will be **cumulative (in part) as statistics is cumulative with each thing learned being a block that builds other and new concepts and learnings.** There will also be weekly exercises and assignments for you to do both outside of and in-class, some of which will be group exercises and assignments. If you die and can produce a valid death certificate, I will **consider** letting you take a quiz on a day other than the day that it is scheduled to be

taken. One of the major purposes of the quizzes is to keep everyone cumulatively progressing at a reasonable and steady (i.e., non-cramming) pace towards the course objectives with periodic and systematic feedback as to how well you are understanding the content and are progressing.

The quizzes and exercises will be graded using a **criteria-referenced** rather than norm-referenced grading system. **The quizzes will count for 75% of your grade and my handout “exercises” (including the individual and group projects) and class work will count for the other 25%.** If you are dissatisfied with or unhappy about your final grade in this course, a cumulative final examination is available for you to take at a time convenient for both of us. If your performance on this final exam is better than your summative performance on all of the other measures, these other measures will be discarded in the determination of your grade for the course; otherwise, all measures will be averaged.

Basic Resources for Course:

Recommended Text(s):

Pagano, Robert. **Understanding Statistics in the Behavioral Sciences (9e)**, available at the **South Campus Book Store**. Excellent basic stat book with lots of resources associated with it including worked out problems, exercises and dataset access and Enhanced WebAssign (cost extra) which has tutorials as well as advanced datasets and worked problems. Does some basic Excel and SPSS instruction and will carry you through 702 as a basic STAT text (so will Ferguson). Pagano is close to the porridge that is “just right,” and has many excellent features, **but it is missing many important points and statistical tests that are common and that you will need and need to know in this course.** It cost money (as opposed to Lowry and Ferguson or other acceptable cheap text). Earlier editions available at www.Alibris.com.

FREE-ON-LINE Stat books, software and helpful web sites: You will need to email me at the following email address (James_Carifio701@yahoo.com), and I then email you back an **electronic form of the list of on-line books and sites** I will hand out in class, so you will not have to type them all in. Emailing me will start the process of your receiving **electronic handouts** from me and **post-class follow-up memos** as well as **my answering your questions** and your **turning in certain assignments** to me. The Yahoo address is the address for doing “course business” to keep it all in one place and my university email uncluttered. **The Lowery FREE on-line text can or could be the main (core) text for the course, but note well (and see below) no one statistics text is sufficient or sufficient for all of the things you need to know.** My favorite and preferred text is Ferguson (see below for details) which is currently out of print but available in many libraries and second-hand book stores and at www.Alibris.com.

Sprinthall, Richard. **Basic Statistical Analysis** (www.Alibris.com). Very Basic Introductory (Undergraduate) Stat Book for Beginners (has disk). Lacks sufficient detail and depth for a doctoral course or doctoral level work, but much liked by students with little or no background in this areas as a place to begin each topic. The **Lowery On-line Text** is an excellent doctoral level text and one of the **‘core texts’ for this course**, as is a copy of **George Ferguson’s Statistical Methods**, which is out of print, but may be obtained at various libraries or at www.Alibris.com (cheaply and quickly). There are other similar texts (see below). Ferguson is considered by many to be the “Goldilocks text” in this area as it is broadly comprehensive and at an advanced level, but not too advanced. Readings on the syllabus are given in terms of these 3 basic books so you can work within, across or between them depending on your preferences and needs.

Microsoft EXCEL: SPSS (The Statistical Package for the Social Sciences) is often too sophisticated of a place for many students to start learning statistics, statistical analyses, and using statistical software packages. SPSS is also not as helpful to understanding the data development and analysis processes as other more simple software options are. A much better initial option for many students is Microsoft EXCEL, as it is much simpler, easier to learn, and more concrete than SPSS, and it can also be used to simulate many things easily and clearly. It does not matter much what version of EXCEL you have. What matters is that you have access to the EXCEL disk and **LOAD ALL OF THE STATISTICAL FUNCTIONS INTO THE VERSION OF EXCEL YOU ARE USING (OR HAVE IT DONE FOR YOU) AS THEY ARE NOT LOAD AS PART OF THE TYPICAL OR STANDARD INSTALLING OPTIONS** (see separate handout for details). Eventually, you have to “migrate” from EXCEL to SPSS (or other software) as your data and analyses become more complex and sophisticated, which begins to happen in the middle of this course and in 702, but a great deal of statistical and data analysis can be done with EXCEL quickly, simply, and economically. A separate handout will be given on SPSS and the variety of texts available for learning to use it. The Student version of SPSS may be obtained by going to www.SPSS.com as can helpful material on SPSS and how to use it for those students who want to jump into the deep end ASAP.

INSTRUCTOR HANDOUT MATERIALS: supplements to and expansions of the above content in class and by email.

Supplemental Resources (DOCTORAL LEVEL STAT BOOKS):

Ferguson, George and Takane, Yoshio. **Statistical Analysis in Psychology and Education**, Sixth Edition (Alibris.com, Library, local libraries, other students). Excellent doctoral level stat book. A classic no longer in print

Glass and Hopkins. **Statistical Methods in Education and Psychology**. In print and an excellent detailed doctoral level stat book that is difficult for many students.

Shavelson, R. **Statistical Reasoning in the Behavioral Sciences**. In print, widely used doctoral level stat book with some flaws.

There are many good basic stat books. **But remember no one stat book is excellent or even good on all things, topics, points, or issues.** Every book is good on some things, not good on others, and has important things missing, as the book reflects the author’s and publishers views and choices. **So typically, you need to be familiar with several good sources that you consult depending upon the issues, problem or point under consideration.** So, please do not tell me that something I said or we covered in class was not in “THE BOOK,” which tends to mean the ONE book you have chosen to read as opposed to the books you should be familiar with as basic resources. Also, the content that we will cover in this course reflects the most commonly used and basic elementary statistical concepts and tests actually used in most educational research, and the foundational elements of each basic and core concepts that are needed to understand the concept and its applications in more advanced forms which reflects the typical usage and analyses seen in research articles, books, reports and program evaluations.

Ground Rules and Your Responsibilities

I have a separate handout on **the ground rules for this course and your responsibilities** that we will go over together point-by-point as a class in the first meeting. In general, I expect you to be **an independent, self-directed, self-managing, adult learner** because that is what you are going to need to be as a doctoral student and most definitely to complete a dissertation. I will provide you with many different kinds and types of resources, including a support group, to help you learn this content, but it is **you who must make all of the requisite and prudent efforts to learn all of the things you need to learn to be successful in this course**. I will also try to give you (meta-cognitive) tips and guidance throughout the course to help you.

For example, the most basic thing you need to learn **first** about statistics is that it is **a highly cumulative and highly inter-related discipline** (set of concept, principles, facts, theories, kind of knowledge etc), which means that you must work on learning it every day or every other day and if you do not learn and understand something, it is going to come back and bite you and bite you hard usually. Trying to cut corners will most probably (statistical concept) **have consequences**.

You cannot cram this content, particularly if it is new and unfamiliar to you. **You cannot cursory or half-learn it**. You must learn it with precision, depth and detail. **All of this takes time and being methodical**. It is like getting into shape or dieting. There are no miracle pills or short cuts and **it is basically boring as all get out (but become very exciting later)** and takes true grit and stamina most of the time. So it is your responsibility to do the readings, exercises, problems and other assignments **BEFORE YOU COME TO CLASS** and do them in a systematic and methodical manner rather than in a last minute cramming way, or not at all (and I am famous for surprise quizzes or surprise in-class-problems). This particular responsibility is the most basic of your responsibilities in this course. All reading have exercises with answers at the end of the chapters: **DO THEM**.

If you have not done the readings and exercises in a systematic and methodological fashion before coming to class, you will have **broken covenant** with me. And, I will ask you for **“PROOF-OF-EFFORT”** if I think you have not been doing the assigned work. If you cannot provide me with proof of effort, please to not expect me to be supportive or understanding of you, or to compensate for your lack of required effort relative to your meeting your basic responsibilities in this course. If, on the other hand, I see observable proof of effort, I will (within reason) keep trying to find ways to help you understand this content and develop the skills you need to develop in this course.

Lastly, you also need to learn the STOP-RULE; if you’ve worked on a problem for 20 minutes and are lost and flummoxed **STOP AND GET HELP**; do not work at it for another hour. This same rule applies to concepts: if you do not have a clue after an hour trying to figure it (and reading alternative sources): **STOP AND GET HELP** (which includes contacting members of your study group); do not work on it for another two hours and then vent at me in class about the chapter or the assignment.

I can give you no more practical or wise advice than the above and the other information on the handout sheet about becoming statistically and research literate.

Schedule/Syllabus: P=Pagano F= Ferguson (Alternative) L=Lowery (On-line text) S= Sprintall (Alternative)
G=Glass

Sept1: Overview and review of basic statistical concepts.

Reading: P= Ch-1, Ch-2; L, Chapter 1, r/and F, pp. 1-51 or/and S, pp. 1-38 or/and G, pp 1-52

Sept 8: Distributions, descriptive statistics, variance, statistical notation, and extending concepts (probability/sampling distributions). Reading: P=Ch-3, Ch-4,,L, Chapter 2 or/and F, 52-82 or/and S, 39-79, or/and G, 53-63 and handouts

Sept15: Descriptive Statistics as a system; scales and standard scores, the normal distribution; simple probability concepts. Reading: P=ch-5, L, Chapter 2, Chapter 5, Part 1, or/and F, 106-109, 83-89 or/and S, 79-99, 103-104; G, 69-86, handouts

Sept 22: Review and Summarization of Descriptive Statistics

Reading: review/finishing readings, handouts

Sept 29: Correlation: Reading: L, Chapter 3, F, 114-144 or/and S, 193-222, or/and G, 87-120 **QUIZ 1: DSTAT AND SIMPLE PROBABILITY (BOP)**

Oct 6: Correlation and Regression.

Reading: P=ch-6 L, Chapter 3a, Chapter 3B, or/and F, 114-144, 415-417 or/and S, 313-328, or/and G, 87-120, handouts

Oct13: Correlation and Regression.

Reading: P=Ch-7, L, Chapter 3,3a,3b or/and F, 474-478;494-498 or/and S, 329-344, G, 121-142 and handouts

Oct 20: Probability and theoretical (probability) distributions

Reading: P=Ch-8, L, Chapter 5, or/and F, 83-102; or/and S, 95-111, or/and G, 143-170, handouts

Oct 27: Sampling distributions. Reading: P=ch10-12, L, Chapter 6, F, 145-165; or/and S, 112-138, G, 143-170

QUIZ 2: CORRELATION AND PROBABILITY (BOP)

Nov 3: Sampling distributions and tests of significance

Reading: P=CH10-12, L, Chapter 7, 8a or/and F, 166-177 or/and S, 139-163, G, 171-188, and handouts

Nov 10: Testing two means (and "tests of two's" in general)

Reading: P=CH13-14, L, Chapter 9, 11, 12 or/and F, 178-197 or/and S, 164-192, G, 189-220, and handouts

Nov 17: Tests of other descriptive statistics: Reading: P does not have this important material, L, Chapter 4, F, 197-211, G, 221-230, and handouts

Dec 1: Chi-Square (and some other non-parametric tests)

Reading: P=Ch-17, L, Chapter 8, F, 212-234 (369-370 opt.) or/and S, 288-312/ (433-439) opt. and handouts

Dec 8: Review of Sampling Distributions and tests of Significance

Dec 15: **QUIZ 3: SAMPLING DISTRIBUTIONS AND ELEMENTARY TESTS OF SIGNIFICANCE: e.g.: z, t, chi-square, F.**

Conceptual Framework: Education for Transformation

*The central tenets of our conceptual framework are
Excellence, Equity, Inquiry and Collaboration*

One of the core skills one needs for evidence based practice is the ability to generate and analyze reliable and valid evidence and to critical review and evaluate the evidence and analyses generated by others and particularly quantitative evidence and analyses. One must be able to critically read and interpret a broad array of evidence and evidence based literature and studies and be knowledgeable about the flaws, short-coming, pitfalls and errors of various statistics, methods, designs, and analyses. One must be able to critically evaluate the evidence based arguments of others and one must be able to engage in professional and scholarly evidence-based discussions, dialogues, debates, and problem solving activities with others as well as to properly write-up and present the results of one's own evidence-based inquiries. Inquiry and research as well as both the science and art of evidence and its interpretation has established standards of excellence and high quality evidence is a key component to in the pursuit of educational and personal excellence and achievement. Learning to analyze evidence in terms of individual differences and from multiple perspectives and theories is critical to full and appropriate analyses and to the pursuit of equity, whether it be personal, intellectual, or/and social.

Inquiry and research is by its very nature collaborative in its conception, design, review, conduct, sharing, inter-subjective validation and translation into practice, and what is called the research literature is a collaborative community that is both nurturing and sustaining once one become an active and literate member. A variety of literature in several disciplines shows that discoveries are made and problems are solved more by teams today than by individuals. Various new studies of publication authorship show that the quality of research and scholarly articles written by multiple authors tends to be higher than research and scholarly articles by single authors and that roughly 70% of scholarly publications in upper tier journals today tend to be multiply authored. Research and scholarly articles in upper tier journals are reviewed by multiple reviewers who differing views of the article must be reconciled before the article is published. And, of course,

your dissertation committee will have a minimum of 3 professors on it for a variety of reasons. Learning to dialogue professionally and collaborate and work with your colleagues and peers and the literature in your own and related areas are key sets of achievements and skills you need today to be a capable professional as well as to do high quality and excellent research and scholarship, as the current research shows.

In this course, you will develop the core knowledge and skills you will need to generate, analyze and interpret reliable and valid quantitative and qualitative evidence and to critically read and evaluate the same generated by others. You will learn the cannons and standards of excellent evidence as well as the limitations of all evidence. The use of a criterion reference assessment and grading system in this course is to give you firsthand experience with a cannon and standards as are the responsibilities I have outlined relative to your own learning. You will learn how to generate and analyze evidence that allows individual differences to be considered and addressed and allows differing views to be assessed and tested; both are equity concerns. You will also learn the norms, cannon, and etiquette of scholarly and professional collaboration relative to evidence and research (by the time you finish the second course required in this area). My use of examples, simulations, and research vignettes for you to analyze and interpret as well as actual data and my use of objective assessments are all directed at these goals as well as my use of learning and support groups in this course.