

STATISTICAL METHODS IN BEHAVIORAL SCIENCE

Psychology 270 01
McAuley Office: 317

Spring, 2010
Phone & Voice Mail: x3120 / 401.341.3120

Professor: Dr. Anthony A. Walsh
e-mail: walsh@salve.edu

Meeting times: Tuesdays & Thursdays, 2:30-3:45

Office Hours: Mondays & Wednesdays, 10:00-12:00AM, other times by appointment.

Course Description- “This course is designed to prepare students to use statistics and its collateral tools to effectively describe, pictorially depict, analyze, and interpret the quantitative results of scientific investigations. Topics include, but will not be limited to, descriptive statistics, graphic methods, inferential statistics, correlation, hypothesis testing, the analysis of variance, and other topics as time permits.” (2009-2011 *Undergraduate Catalogue*, p. 256)

Course Objectives- In this course the basic concepts and techniques of statistical quantification are explored. Emphasis will be placed on the application of statistical techniques in the analysis and interpretation of data gathered in a variety of ways. A basic underlying assumption is that to the extent a person can develop competence in the use of statistical methods, that person will be better equipped to contemplate sophisticated --i.e., logically meaningful--questions and analyze the answers to them correctly. It is also assumed that the well-informed person, aware of statistical techniques, will be a more intelligent consumer of technical reports that use statistics to either support or refute hypotheses or other theoretical or special points of view. Included among the objectives of this course, therefore, is the goal of providing students with a sufficient understanding of this subject so that they may use this knowledge with intelligent confidence and be capable of evaluating how others have used statistics (or abused them) in technical research reports.

Teaching Methodology- This class will be conducted as a lecture class as well as a class in which students will be required to work on and solve illustrative statistical problems under supervision. The professor will introduce the students to a variety of statistical procedures by means of lectures and explanatory examples. Students will then have an opportunity to work on statistical problems in class in order to acquire mastery of these procedures. Additional practice problems will usually be distributed as homework.

Text- Witte, Robert S. & John S. Witte. *Statistics*, 9th Edition. New York: Harcourt, 2010.

Course Web Site- The web site associated with this class is particularly important and is a major resource for statistics educational content. It is located at this URL: <http://inside.salve.edu/~walsh/statistics2.html> Students are advised to “refresh” or “reload” their browser when accessing this site since it is updated regularly. By “refreshing” or “reloading” the page you will insure that you have the very latest version of it. Access to some of this material will require the free *Adobe Acrobat Reader*® browser plug-in. Also, some material is viewed best with the *Internet Explorer*® 4.0 or later.

Other Requirements- Students are required to obtain a pocket calculator with the ability to calculate square roots, learn how to use it, and **BRING IT WITH THEM TO EVERY CLASS** to use on practice problems and exams. Failure to do this will mean that you will be unable to participate fully in the activities of the class.

Grades- Grades in this course will be based on performance on *examinations*. All exams (3 plus a final), furthermore, will generally be somewhat cumulative in the sense that the problem solving questions will be building (in part) on earlier procedures.

Exams will contain problems requiring you to use a calculator and they may include a mixture of “closed notes” and “open notes” sections. The “closed notes” sections will assess your mastery of statistical terms, concepts, and interpretation of statistical results. During the “open notes” section of exams, you may use your own notes from lecture, your own summarizations from other sources including the internet, off prints from the class web site, and any hand-outs or practice problems that have been distributed, and your text.¹ **You may not share notes or materials during exams. You must be self-contained! And this includes having a working calculator of your own. You cannot borrow anything from anyone during exams.**

Final Grade Calculations: Exam1 =15% Exam2 =20% Exam3 =30% Final Exam =35%

$$\text{Final Grade} = ([\text{Exam1} \times 1.5] + [\text{Exam2} \times 2.0] + [\text{Exam3} \times 3] + [\text{Final} \times 3.5]) / 10$$

Attendance- The University expects students to attend their classes regularly unless good reasons prevent them from doing so.

In this class, students are advised to establish an in-class contact or contacts to share & review notes, especially from missed classes, pick up homework problems for them in case they have to miss a class, and keep track of what transpires in class, especially before returning to a later class since each class builds on earlier ones.

Students should not attend any classes in the university, including this one, if they have FLU SYMPTOMS!

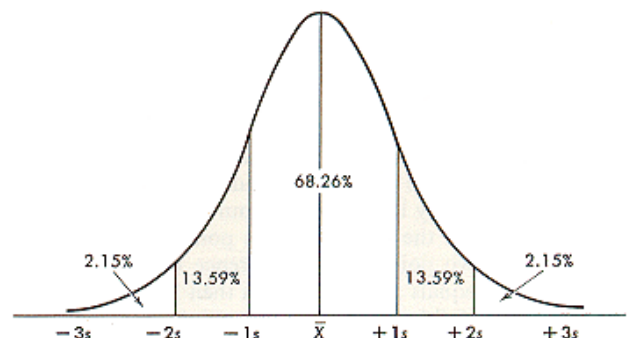
Important Dates: Spring, 2010

January 19 th	Spring Classes Begin (Tuesday)
January 26 th	Last Day to Change Semester Registration (Tuesday)
February 15 th	**President's Day – No Classes** (Monday)
February 16 th	All Monday Classes Meet – No Tuesday Classes (Tuesday)
February 16 th ~ 19 th	Fifth Week Evaluation Period
March 6 th ~ 14 th	**Spring Break**
March 15 th	Semester Classes Resume (Monday)
March 19 th	Last Day to Withdraw from a Semester Course without Penalty
March 25 th ~ 31 st	**Registration for fall 2010** (Thursday ~ Wednesday)
March 26 th	**SRyou: Student Exposition 2010** ~ No Classes (Friday)
April 1 st ~ 5 th	**Easter Break** (Thursday ~ Monday)
April 6 th	Classes Resume (Tuesday)
April 7 th	All Monday Classes Meet – No Wednesday Classes
April 29 th	Last Class (Thursday)
May 1 st ~ 2 nd	Reading Days (Saturday ~ Sunday)
May 4 th	Final Exam ~ 1:00pm (Tuesday)

Disability Accommodations: Students with disabilities should submit a *Notification of Disability Form* to the professor within the first two weeks of class. This form is available through the *Office of Disability Services* in the *Academic Development Center* in McKillop Library. Students are advised to speak directly with the professor concerning specific requests for reasonable accommodations (e.g., extended time testing).

¹ The University's numerical *Grading Policy* is represented as follows in the *Undergraduate Catalog*:

Grade	Point Value	Numerical Equivalent
A Excellent	4.0	95-100
A-	3.7	90-94
B+	3.3	87-89
B Above Average	3.0	84-86
B-	2.7	80-83
C+	2.3	77-79
C Average	2.0	74-76
C-	1.7	70-73
D Below Average	1.0	65-69
F Failure	0.0	Below 65



Statistical Methods in Behavioral Science *Chronology*, Spring, 2010, PSY270, TTh 2:30-3:45
Approximate dates for coverage of Topics, Readings, Videos, Activities, Tests, etc., by Week

Day/Week/or Week Date	Topic
1 / January 19 th	<p>Introductory matter is presented this week which includes the course description, objectives, teaching methodology, text, attendance regulations, the course web site, “other requirements” (specifically personal responsibility in re: to having a calculator at each class), grading, disability accommodations and key dates for the term.</p> <p>Read Chapters 1 & 2 in your textbook for this first unit.</p>
2 /January 26 th	<p>Key basic <i>concepts</i> in statistics including <i>common terms</i> and their definitions are introduced this week. Also discussed is how statistics may be manipulated, not always for benign ends. We then turn to the subjects of <i>levels of measurement, quantitative vs. qualitative</i> data, types of <i>variables</i>, and the process of organizing and summarizing data with <i>tables</i>.</p> <p><i>Frequency distributions</i> for <i>grouped</i> and <i>ungrouped</i> data are introduced along with their construction rules. <i>Relative frequency</i> distributions are also explained, as are the concepts of <i>proportions, percents, and percentiles</i>. We will still be dealing with material in the first 2 text chapters plus content in the web site document stat_tables.pdf.</p>
3 / February 2 nd	<p>Graphs for both <i>quantitative</i> and <i>qualitative</i> data are introduced at this time supported by both text Chapter 2 and stat_graphs.pdf on the web site. <i>Pie charts, histograms for quantitative</i> and <i>bar graphs for qualitative data, frequency polygons, and stem and leaf plots</i> and related subjects are explained.</p> <p>Exam 1 is tentatively scheduled about now (Tuesday or Thursday depending on our progress) on all assigned reading to date plus lecture content, web site content, and video content.</p> <p>Chapters 3, 4 and 5 in our text will provide preparation for the new material <u>in the next unit</u>.</p>
4 / February 9 th	<p>We turn next to the concept of “averages” for quantitative data known, to be precise, as <i>measures of central tendency, viz., the MEAN, MEDIAN, & MODE</i>. The reading assignment for this unit is Chapters 3 in our textbook and the support materials on the web site including the first part of the stat_MMM.pdf document.</p>
5/ February 18 th	<p>We turn now to the concept of <i>variability</i> discussed in Chapter 4(and the 2nd part of the stat_MMM.pdf document) including the several common measures of it including the <i>range, interquartile range, variation, variance, standard deviation</i> and, for the latter two statistics, formulas for their descriptive & inferential calculations. Chapter 5 discusses our next subject, standard scores.</p>
6 / February 23 rd	<p>The variability unit will continue this week and based on it, the <i>normal curve, its theoretical underpinnings, area properties</i> and how statisticians use them, <i>z scores</i> and other <i>standard (-ized) scores</i>, and related matters are presented. EXAM 2 follows this unit.</p>
7 / March 2 nd	<p>Exam 2(tentatively) about now. Chapters 19(on Chi Square) & 6(on Correlation) are <u>recommended</u> for the next unit.</p>

8 / March 16th

We will turn next to our first statistical test, *viz.*, *Chi Square*. Support materials may be found on the course web site; and in our textbook in **Chapter 19**. Furthermore, Lowry's online statistics textbook, Chapter 8, at <http://faculty.vassar.edu/lowry/webtext.html> is also suggested if you wish to read more on the subject or read a different writer's "take" on it. We will be comparing the "One Variable" **1 x c** "equal expected frequencies" and "goodness of fit" versions as well as the "Two [or more] Variables" **r x c** "contingency table" version of this statistic and its applications.

Statistical decision making and how we draw conclusions about *statistical significance* will be introduced at this time along with the role of *probability* in the process and the concept of the *Null Hypothesis*. [**Chapter 8** in your text discusses probability commencing on p. 181. Review it, if you wish, to get a feel for this often arcane subject].

9 / March 23rd

Chi Square and making statistical decisions will continue this week along with further examination of the role of probability in this process. On line statistical analysis programs may be reviewed along with Excel's *Data Analysis Pak* ©, time permitting.

10 / March 30th

Correlation is next on our agenda in both its *parametric* and *non-parametric* versions (if time permits). We will learn about *scatter plots*, *linear relationships*, the *Pearson r*, the *Spearman rho*, the *Coefficient of Determination*, and other matters associated with the assessment of the correlation between pairs of variables. The *Pearson r* is discussed in Witte in **Chapter 6** & on Lowry's web site in Chapter 3 and Chapter 3b at: <http://faculty.vassar.edu/lowry/webtext.html>

11 / April 6th

Exam 3 about now. This exam will focus on *Chi Square*, *Pearson r*, and *Spearman's rho* (if covered in class). **Chapters 14, 15 & 16** are suggested reading for the next unit.

12 / April 13th

t test for two Independent Samples. Our next topic will be the *independent t statistic*, also sometimes called the *Student's t test*, which tests for the independence of two "presumed-to-be-independent" group sample means. A version of this statistic which is used with either a "**matched groups research model**" or a "**before and after single-group-of-subjects 'repeated measures' research model**" will also be examined. Witte's **Chapters 14**(on the "t test for two independent samples") and **15**(on the "t test two related samples {repeated measures}") are recommended reading along with Lowry's Chapters 11 & 12 at: <http://faculty.vassar.edu/lowry/webtext.html> The use of "effect size" calculations as an indicators of the strength of statistical outcomes is introduced.

12 / April 20th

The Single Factor Analysis of Variance (ANOVA). During this next to last week, we will extend the "t test for two independent samples" which is designed to be applied to only two "presumed-to-be-independent" groups of subjects to a situation where we have 3, 4, or more "presumed-to-be-independent" groups of subjects all of whom have been exposed to differing amounts of a common independent variable, the "single factor." The "one way" (as it is sometimes called) or *single factor analysis of variance* discussed in Witte in **Chapter 16** and at Lowry's site at: <http://faculty.vassar.edu/lowry/webtext.html> in Chapter 14 are recommended. *Tukey's HSD post hoc* is demonstrated(q.v. Witte & Witte, p. 359).

13 / April 27th

OPEN. Other topics as time permits.

January 12, 2010
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