

# **Psychology 302 – Statistical Methods in Psychology**

Summer 2011

Lecture are held Mondays-Thursdays at 10-10:50 am in 104 Condon

Labs are held Fridays at 9-9:50 and 10-10:50 in 180 Straub (open M-F during day)

## **Lecture Instructors:**

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## **Lab Instructor:**

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Office Hours: 11:00am-12:00pm on Wednesdays and 1:00pm-2:00pm on Thursdays

## **OVERVIEW OF COURSE STRUCTURE**

**Course Objectives:** At the end of this course you will be able to read a description of a research study and then identify the appropriate statistical technique needed to answer the research question. You will be able to identify problems and issues with data sets through exploratory data analysis. You will be able to describe and evaluate data using summary statistics. You will be able to use inferential tests and measures of effect size (both computing by hand and using statistical software) to answer research questions and draw conclusions (written in APA style) based on your analyses. Using the knowledge you gain here, you should be better equipped to evaluate statistical information reported in popular media as well as in primary research articles.

**Course Description:** This class both is and is not really a math class. Although you will be learning how to do statistical calculations by hand, this course is very different from courses taught in mathematics departments. The focus in this class is on conceptual understanding of statistics and the application thereof to psychological science. In the past, most students have found that the actual “number crunching” in this class is relatively easy. It is the conceptual understanding of statistical techniques that is more difficult. Once you understand the concepts, you will probably have little trouble doing calculations. Quizzes will be focused on conceptual understanding, while homeworks will be focused primarily on applying concepts to actual problems. Please keep this in mind as you approach this course.

**Course Design:** There are approximately four lecture sessions and one lab session each week for eight weeks. The course promotes active learning through applied examples, use of real data (your own!), solving problems, and computer exercises. The instructors and TA are guides, cheerleaders, and coaches. The course encourages teamwork among students, instructor, and TA. *Although quizzes are to be completed individually, students are encouraged to work together on homework.*

**Responsibilities:** If you complete this course, you will earn 4 credits toward your degree. According to University principles governing credit and contact hours, each credit is equivalent to 30 hours of work. Your 4 credits for this course are equivalent to 120 hours of work over 8 weeks, which is 15 hours per week. You will spend a little less than 5 hours in class and lab each week and should expect to spend a little over 10 hours engaged in reading, studying, and/or completing homework assignments outside of class each week.

## COURSE REQUIREMENTS

**Participation:** Participation includes in-class activities designed to increase understanding of concepts discussed that day. Credit is not at all based on whether you got the right answer, but only on whether you tried. Another purpose of this is to provide a grade boost for those students who are trying hard (i.e., attending lecture and lab, doing the homeworks, using the readings and lab handouts appropriately, and studying for quizzes), but are still not doing as well as their effort expended would suggest. However, to maintain a balance, this is only 5% of the overall grade, which isn't very big. So, it won't really penalize those who don't want to come to every class because they don't need to try as hard to do really well.

**Homework:** Homework assignments are due **in lab each week beginning week 2** (at the beginning of your lab session). Some problems will be completed "by hand", some using PASW, and some using both methods. **Turn homework in on time!** Late homework, which is any assignment turned in after the beginning of your lab on the day it is due, earns **NO** credit. Homework is an important tool for learning the material, so there is extra incentive to complete all assignments (even if they are turned in late). If you turn in all homework assignments by August 10 you will earn 5% of your total course grade and your lowest homework score (including a zero, if you turned in an assignment late) will be replaced with your highest homework score. Scheduling and content of homeworks are subject to change at the discretion of the instructors.

**Quizzes:** You will have 30 minutes to complete each quiz. Be on time!! Quizzes will cover all material since the previous quiz and will be primarily multiple choice and T/F format. Quizzes are closed book and are completed individually. Calculators are unnecessary, as quizzes will test your knowledge of conceptual material rather than your ability to perform calculations. On quiz days, we will have a 15-20 minute lecture prior to the quiz. Absolutely no texting or other use of electronic devices is permitted during scheduled quiz time. Scheduling of quizzes is subject to change at the discretion of the instructors.

**Books & Calculator:** The required text is Gravetter & Wallnau, *Essentials of Statistics for the Behavioral Sciences*, 7<sup>th</sup> edition. Read assigned material **before** class and do Learning Checks as you encounter them. **Reread** if you encounter trouble on a Learning Check. The second time, you will understand more. You will also need a hand-held **calculator** that can do single variable statistics. No need for graphing calculators. **Bring calculator & text to class.**

## SPECIAL NEEDS

**Students with Disabilities:** If you have a documented disability and may need accommodations, contact us ASAP. Please let us know in advance even if you are not sure that your disability will require accommodation (for example, if you have a physical disability that may require you to miss class, but you

aren't sure it will). Students who are experiencing learning difficulties are encouraged to consult Disabilities Services (164 Oregon Hall; 541-346-1155; [disabsrv@uoregon.edu](mailto:disabsrv@uoregon.edu); <http://ds.uoregon.edu/>). Without documentation, accommodations are not guaranteed and are to be made at the discretion of the instructor.

**Other Students:** If you are repeating this class, or have other circumstances that might affect your ability to devote time to the class, please let us know now so we can discuss strategies to promote your success in this course. If you wait until you have problems in the course, it may be too late to salvage your grade, but planning ahead will likely lead to success.

## COLLABORATION

**Homework:** Discussing homework with other students and your instructors is encouraged. Talking over the problems and reworking them when you discover that others got different answers promotes deeper understanding of concepts. However, each student must submit a separate homework, *written independently* (no photocopies, printing out multiple copies of PASW output, or word-for-word copying), and you must show your work for all by hand calculations. More explicitly, you may work together to solve problems and check your answers on homeworks with each other, but preparing those answers for your homework and the actual writing of **any** answers need to be done independently.

**Quizzes:** Your work on the quizzes must be your own. Copying the work of others on these elements is cheating, and will earn you an F for the course. (The University may impose additional penalties in accordance with the student conduct code.) Quizzes are a reflection of individual work (closed book, closed notes) - rely on your own knowledge only.

## TOP EIGHT SUCCESS STRATEGIES

**1. Read the syllabus.** This may sound stupid, but seriously, read the syllabus!

**2. Read the assigned material.** We have attempted to make the assigned readings minimal due to the accelerated timeline of this course. We have separated, to the best of our ability, the content that you need to know to understand lectures fully (labeled READ on the course schedule below) and the content that you need to know to understand how the statistical techniques work and how to do them by hand (labeled REFER). This is not a perfect separation by any means, but we gave it a shot, because it is our view that reading carefully how to compute a statistic is not all that useful. You should simply be able to know a) what to look for it and b) where to find it. Thus, the book, in our opinion, is best thought of as a reference tool and this particular one is fairly user-friendly.

Many of you may be tempted to read more than the assigned sections/pages, and this is completely fine, but ***please be forewarned that we have chosen to depart from a large theme in the book (Null Hypothesis Testing) in our treatment of introductory statistics.*** In our experience, this has been a consistent stumbling block for students and is unnecessary for grasping important concepts. Feel free to skim or skip sections referring to Null Hypothesis Testing in your readings.

Although not explicitly noted in the course schedule, you should also refer to the sections titled "Learning Check" and "In the Literature" for the relevant readings. The Learning Check sections will help you

understand the material and the In the Literature sections will help you with writing your interpretations of results in APA style.

One more note on readings: another primary emphasis of this course is on identifying and articulating research questions about real world phenomena and interpretations of data gathered to test those ideas. As such, for each homework problem involving data analysis, you are expected to a) frame the research question such that it can be addressed by the analytic technique you use in testing it and b) interpret the results of your analysis in a substantively meaningful way. In other words, say what you're doing and say what you found by doing it.

**3. Complete the homework assignments (and turn them in on time for credit).** Nearly all students who fail this course fail primarily because they either do not complete their homework assignments, or do not complete them on time. We do not know of a single student who has failed who has also turned in all completed homework assignments on time.

**4. Attend the class sessions.** You are adults. If you don't want to come to class, that's your choice, but you (and you alone) are responsible for learning and understanding the material covered in this course. Thus, if you miss class, you are responsible for finding out what you missed. You can make a friend in class whom you trust to reliably and accurately convey information. Or, you can come to Brian's, Carly's, or Bill's office hours. Although coming to office hours to ask questions and clarify confusions is highly encouraged, office hours will not be make-up lectures. Missing class, for whatever reason, does not automatically entitle you to special treatment or relaxed deadlines.

**5. Attend your lab section.** Again, you are adults, but in order to complete the homework problems, you will need to learn how to use the computer program PASW, which will only be covered in lab. If you know you will have to miss a lab, let your TA know and try to attend a different lab section. Failing that, ask a friend, or come to office hours.

**6. Refer to your lab handouts.** Your lab handouts are your friends in this course. These are your reference tool for using PASW. They are also in some ways a better reference tool for conceptual information than is your book. Several of them even contain more information than you will actually be able to cover in a lab period. So, make use of them when doing homeworks and studying for quizzes.

**7. Ask questions.** This is an *introduction* to statistical methods in psychology. You are not expected to know *anything* about this topic yet. However, we do assume some basic mathematical knowledge, which is why Math 111 (or Math 243) is a prerequisite for this course. Specifically, you should have at least a basic understanding of Algebra and know how to plot a line. That said, there are very few questions that are "dumb," whereas there are lots of dumb answers. It's likely that we will give some dumb answers during the course. It's your job to ask questions when you don't understand something. If you don't know how to ask about what's confusing you, a completely legitimate response to not understanding something is saying, "I don't understand." So, speak up! This is the only way we will know when we are not explaining something clearly. You can ask questions in class, in lab, by e-mail, and in office hours. This provides multiple modes by which you can inquire about the material. We hope you are comfortable with at least one of them.

**8. Study for quizzes.** The quizzes will focus on your conceptual understanding of course material covered in lecture, labs, and readings. The best way to study for quizzes is to attend all classes and labs,

complete all assignments, do all your reading, and ask questions when you don't understand something. **Quizzes are different from, but complementary to homeworks!** Homeworks typically test your ability to perform analyses and apply concepts, whereas quizzes test your understanding of those concepts on a deeper level without asking you to perform analyses.

## TOP FIVE PITFALLS

**1. Concluding that struggling in this course means you just can't get statistics.** This course draws upon several different types of skills – math skills as well as conceptual understanding skills. It is unusual for any given student to sail through without struggling with at least some element of the course. Failing is only an indicator that you need to put forth more effort – not that you aren't smart enough to do it! We will do our best to teach in a way that meets your individual needs, but we don't know what those needs are until you tell us. So speak up when you don't understand something!

**2. Passive listening and reading.** Write, draw, figure. Think with a pencil to learn. Turn the concepts into something you do. Apply them to what you know. To succeed, you must be able to explain and execute, not just regurgitate.

**3. Beginner's luck.** Doing it right once doesn't mean you can repeat the trick. Get it wrong to understand how the process works. Mistakes help you learn.

**4. Trying to cram.** You can cram content (sort of), but skills don't compress. Don't fall behind; it's too hard to catch up.

**5. Giving up because you get stuck.** Everyone gets stuck. Math is all about getting stuck and unstuck. When this happens, play around. Try a new tactic. *\*\*Ask for help.\*\**

**6. Spectator overconfidence.** Watching someone go through the steps is a starting point only. You have to get in the pool to learn how to swim.

## GRADING

*Final course grades* are based on the following:

- 45%** Score on the 7 homework assignments (lowest score replaced with highest, if all homework is completed), each worth 6.4% after lowest is replaced
- 45%** Score on 4 quizzes/exams, each worth 11.25% (lowest score replaced with make-up quiz score).
- 5%** For turning in *all* homeworks. These are “all or none” points, earned if you turn in all assignments, and not earned if you do not. They are an added incentive for completing all homeworks.
- 5%** Participation in in-class exercises

Final grades will be based on percentage of total possible points earned, distributed as follows:

Course grades based on percentage of points			
	Percent		Percent
A	93-100	C-	70-72.9
A-	90-92.9	D+	67-69.9
B+	87-89.9	D	63-66.9
B	83-86.9	D-	60-62.9
B-	80-82.9	If taking Pass/Fail	
C+	77-79.9	NP	< 70
C	73-76.9	P	70

# COURSE SCHEDULE

Dates	Instructor	Topic	Readings	Quizzes/Homeworks
6/20	B & C	Course Introduction		
6/21	C	Visualizing Data with Graphs	READ: 2.3; 2.4	
6/22-23	C	Central Tendency and Variability	READ: 3.1; 3.6; 4.1; 4.3; 4.4 REFER: 3.2; 3.3; 3.4	
6/24	Bill	LAB 1		
6/27-28	C	Z-Scores and the Normal Distribution	READ: 5.1; 5.5; 5.6; 6.2; 6.3 REFER: 5.2; 5.3;	
6/29-30	B	Probability and the Normal	READ: 6.1; 6.4 REFER BACK TO: 6.2 & 6.4	Quiz 1 (6/30)
7/1	Bill	LAB 2		HW 1 Due
7/5-6	B	Distribution of Sample Means	Ch. 7 (the whole thing ...yes, we know)	
7/7	C	Z-test	READ: 202-204; 231-233	
7/8	Bill	LAB 3		HW 2 Due
7/11-12	C	One-Sample t-test	READ: 9.1; 9.3	
7/13-14	C	Paired-Samples t-test	READ: 11.1; 11.2; 317-318; 11.4	
7/15	Bill	LAB 4		HW 3 Due
7/18-19	B	Independent-Samples t-test	READ: 10.1; 1 <sup>st</sup> half of 10.4 REFER: 280-286; 289-292	Quiz 2 (7/19)
7/20-21	B	Introduction to ANOVA	READ: 13.1 & 13.2 REFER: 13.3; 13.5;	
7/22	Bill	LAB 5	13.6; 13.7	HW 4 Due
7/25-26	B	One-Way ANOVA		
7/27-28	C	Repeated-Measures ANOVA	READ: 418-419; 421-427	
7/29	Bill	LAB 6		HW 5 Due
8/1-2	C	Factorial ANOVA	READ: 428-430; 432-435; 437-439 REFER: 439-447	Quiz 3 (8/2)
8/3-4	B	Correlation	READ: 15.1, 15.3, 15.6 REFER: 15.2	
8/5	Bill	LAB 7		HW 6 Due
8/8-9	B	Regression		
8/10	B & C	Review and Recap		HW 7 Due
				Quiz 4 (8/11, 8am)

# HOMework ASSIGNMENTS

Scheduling and content of homework assignments are subject to change at the discretion of the instructors. Put your name and your TA's name on all homework, and PLEASE STAPLE!!! All work must be neat and legible. If we can't read it, we can't grade it! **Turn homework in on time!** To earn full credit, show and explain all work. For problems completed by hand, show all steps of your computations. The process of obtaining a solution is more important than simply obtaining the final solution. You must also demonstrate that you are able to read and understand what you have produced. You must interpret your results in an APA style summary. The whole point of doing statistics is to help answer questions about the world, not to do math for the sake of doing math. The book has answers to odd-numbered problems in the back. Use these for extra practice or to check your work on relevant homework problems.

## **Homework 1: Exploring data with graphs, Central Tendency & Variability (15 pts)**

**Ch. 1:** problems 1 & 18

**Ch. 2:** problem 11 (using PASW)

**Ch. 3:** problems 6 & 8

**Ch. 4:** problems 4, 16 (by hand), & 19 (using PASW)

## **Homework 2: z-scores, Probability and the Normal Curve (15 pts)**

**Ch. 5:** problems 2, 4, 14, & 22 (a & c; be sure to explain your answers) For all problems, show your work.

**Ch. 6:** problems 5, 8 (a & c), 10, & 21. Hint: Make drawings for problem 10.

**Ch. 7:** problems 12 (show your work) & 22

## **Homework 3: z-test and t-test (15 pts)**

**Ch. 8:** problems 2, 4, 7 (a & b; show your work), & 8.

**Ch. 9:** problems 1, 8 (show your work), 10 (show your work), & 23 (show your work; do part a in PASW, but parts b & c by hand; interpret the results in an APA-style write-up). Be sure to explain all of your answers fully.

## **Homework 4: t-test with independent samples and paired samples (15 pts)**

**Ch. 10:** problems 2, 3, 4, 5, & 19 (show your work; interpret the results in an APA-style write-up), 22 (using PASW only; compute Cohen's  $d$  as a measure of effect size; interpret the results in an APA-style write-up)

**Ch. 11:** problems 2, 3, 19 (show your work), & 21 (by hand and using PASW; compute  $r^2$  as a measure of effect size; show your work for hand calculations; interpret the results in an APA-style write-up)

### **Homework 5: One-Way ANOVA (15 pts)**

**Ch. 13:** problems 3, 14 (show your work), 16, & 21 (a & b; part a by hand and using PASW; part b by hand only; show your work for all by-hand computations; conduct a contrast or set of contrasts, i.e., pairwise comparisons, that make(s) theoretical sense to you and justify your choice of contrast(s); generate a bar graph to graphically depict the results, make sure to include error bars; interpret the results in an APA-style write-up).

### **Homework 6: Repeated and Factorial ANOVA (15 pts)**

**Ch. 14:** problems 1, 3, 12, 13 (by hand only; show your work), 18, 22, & 25 (a & b; using PASW only; generate a bar graph to graphically depict the results, make sure to include error bars; interpret your results in an APA-style write-up). For problems 12 and 22, show all work involved (i.e. for each *SS*, *MS*, etc.) except for *df*.

### **Homework 7: Correlation and Regression (15 pts)**

**Ch. 15:** 1, 2, 5, 9 (using PASW only; generate a scatterplot of the data with a regression line; interpret your results in an APA-style write-up), & 25 (by hand only; show your work).