Psychology 216 (003 - 006)
Applications of Statistics in Psychology

Dr. Robert Lorch
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Hours: Monday, 2-4 and by appointment

	003	**004**	**005**	**006**
Schedule	W 9:00 – 10:50	W 11:00 – 12:50	W 1:00 – 2:50	W 3:00 – 4:50
Location	CB 233	OT 145	OT 110	CP 111
TA	David Combs	Jennifer Lowe	Jennifer Lowe	Caitlin Powell
Office Hours	Mon, 7:00-8:00 Wed, 11:00-12:00 Kastle 004	Thurs, 12:15-1:15 Fri, 2:30-3:30 Kastle 111E	Thurs, 12:15-1:15 Fri, 2:30-3:30 Kastle 111E	Mon, 9:00-10:00 & by appointment Kastle 0004
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Goals of the Course

The aims of this course are to help you develop an understanding of major concepts that underlie the use of statistics in psychological research, and to help you learn how to choose and carry out statistical procedures that are appropriate for different research purposes. Psychologists are interested in understanding a variety of phenomena and they use a wide variety of methods and measures to study the objects of their interest. Regardless of the content or conditions for study, statistics serve as important tools for making sense out of the data that are collected. We need statistics in order to **describe** the data clearly, so that the findings can be communicated to others. We also need statistics in order to use a specific data set as a basis for more general conclusions. That is, we can use statistics to **infer** general conclusions from the data collected. In this course, we'll cover both of these functions. We'll examine a variety of ways to describe data, and will discuss reasons to choose particular methods. Likewise, we'll develop a general logic of how to make inferences from data, and then cover a number of different statistical tests that are appropriate for different situations (but all of which use the general logic).

An important point to keep in mind: You could think of this course as involving information about the **"what"** of statistics (e.g., what is a "mean" and how is it calculated? What is a "t"statistic and how is it calculated?) and the **"why"** of statistics (e.g., given a particular research question and type of data, why is a certain statistical procedure appropriate? given a certain statistical procedure is appropriate, why does the research question influence exactly how the procedure is executed? why is a certain interpretation warranted given the results of a statistical test?). The "what" side involves the mechanics of the subject. If you're paying attention and putting in a reasonable amount of time, the mechanics should be pretty straightforward. The "why" side is the part that is **most critical for understanding** and that requires the **most mental effort on your part**. The "why" side starts with fairly simple reasons for decisions about descriptive statistics, but gets more complicated as we move through inferential statistics. The bottom line message: You're not likely to learn very much or do well in the course if you just get the mechanics. If you push to see the reasons for certain decisions or choices that are part of using statistics, you'll come away with a better understanding of the material and a better course grade.

Required text and supplement:

Pagano, R. (2004). Understanding statistics in the behavioral sciences (7th edition). Pacific Grove, CA: Brooks/Cole Publishing Co.

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- **Problem Sets will generally be due on Mondays at 3:00, delivered to the TA's mailbox.**
- **Exam dates will be set at least a week in advance of the exam. The first exam comes up quickly – best guess is September 13th.**

Course Outline

Topic	**Assignment**
I. Introduction	Chapter 1 Pay special attention to Definitions on pp. 6-7
II. Univariate Descriptive Statistics	
A. Data Presentation: Tables and graphs	Chapter 2 (omit Real Limits, pp. 32-33) Chapter 3 (omit Percentiles, pp. 47-52)
B. Summarizing data: Measures of central tendency and variability	Chapter 4

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EXAM 1: Sept. 13
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III. Probability	
A. An intuitive approach to probability	
B. A formal approach to probability	Chapter 8
C. The binomial distribution	Chapter 9
IV. Introduction to Hypothesis Testing	
A. Basic Concepts	
B. Procedures in testing	Chapter 10
C. Errors in testing and power	Chapter 11
V. The Chi-Square Distribution	
A. Extension of binomial distribution	
B. Goodness of fit test	Chapter 18
C. Test of association	(omit pp.441-454)

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EXAM 2
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VI.	The Normal Distribution	
	A. Theoretical foundation: Central Limit Theorem	
	B. Applications	
	1. Standard scores	Chapter 5
	2. Hypothesis testing	
	a. Single mean	Chapter 12
	b. Difference between two means	
	3. Confidence intervals, power	
VII.	The t-distribution	
	A. Theoretical foundations	
	B. Hypothesis tests & confidence intervals	
	1. Single mean	Chapter 13 (omit pp. 309-311)
	2. Two independent means	Chapter 14
	3. Two correlated means	

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EXAM 3

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VIII.	Bivariate Distributions	
	A. Description of bivariate distributions	
	1. Data presentation: Scatterplots	Chapter 6
	2. Describing a relation: Regression	Chapter 7
	3. Measuring a relation: Correlation	Supplement pp. 48-51, 54-55;
	B. Bivariate Statistical Inference	pp. 309-311 Supplement pp. 56-60
	C. Interpreting Correlation & Regression	

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EXAM 4

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Course Requirements

I. Assignments

A. Problem Sets

1. Problem sets will be assigned approximately one per week. The problem sets are very important in helping you to master the material and prepare for exams.
2. Each problem set that you turn in **by the due date** will be graded on a 1 to 3 scale. **You will receive a 0 if you do not turn in a problem set, or turn it in late**.
3. Problem sets count for a relatively small percentage of your course grade (6.25%) and can actually gain you extra credit if you do well on them. They are graded to encourage you to keep up with the work; they'll hurt you only if you DON'T make the effort. Feel free to work on problem sets with other class members or to ask the TA or me for help if you are stuck. REMEMBER: THE PROBLEM SETS ARE TO HELP YOU TO LEARN.

B. In-class exercises:

I will often ask you to complete certain exercises in class. Sometimes these may be problems that extend concepts covered in class; sometimes I may pose questions that ask you to consider implications of the material. The exercises will generally be done in groups. The in-class exercises are a way of encouraging your active involvement with the material.

C. Class attendance:

Attendance at lectures is expected and will be a component of your grade. A minimum of 22 of 28 classes must be attended for full credit for attendance. Less than the minimum will incur a penalty in grading; you will earn extra credit if you attend more than 22 lectures and more than 8 labs.

II. Exams

A. Four exams are planned. It is possible, however, that the number of exams may be changed, depending on the pace that's appropriate for the class. There will not be a cumulative final exam, but you'll find that you'll need to keep using previously covered material throughout the course. Exam 1 covers less material and will count for a smaller proportion of your grade than each of the other exams (see Grade Assignment section below).

B. The course will stress concept mastery and applications and will minimize the need to memorize formulas. You will be permitted to use calculators, and to bring a "cheat sheet" to the exams. The cheat sheet can be one standard size (8 1/2" x 11") piece of paper containing whatever information you see as most important (e.g., formulas, rules, outlines of procedures, etc.). If you are to bring any other materials to any exam, I'll let you know. If possible, exams will be scheduled during lab times, as indicated in the outline above. Please note that the dates given for the first three exams are estimates, because different classes complete the work at slightly different rates. The exact date of each exam will be announced in class and lab; you are responsible for making sure you get this information and are able to attend the exam.

C. If you cannot attend an exam at its scheduled time, you must notify me in advance and have your absence excused or you will not be allowed to take a make-up. You can let me know by telling me in person, by putting a note in my mailbox in Kastle Hall, by e-mail, or by phone. If you do not speak directly to me, you MUST leave a phone number where I can reach you. **You will receive a zero for the exam if the absence is not excused in advance.** IMPORTANT: Unless I APPROVE your absence in advance (that is, the absence is due to a last-minute emergency that could not be approved in advance), you must provide documentation of the reason for your absence before it can be excused.

III. Labs

A. The first priority of labs is to cover trouble areas on the problem set for the preceding week. After that, material from current lectures and on the upcoming problem set will be covered. Labs usually will involve working on additional problems, especially concerning topics that are causing difficulties. You are always encouraged to ask questions, but labs are a particularly good time to ask about anything that is causing you problems.

B. Attendance at labs is expected and will be a component of your grade. A minimum of 8 of 11 classes must be attended for full credit for attendance (exam days are not included). Less than the minimum will incur a penalty in grading; more than the minimum will earn extra credit.

IV. Attendance Policy

Attendance at lectures and labs is very important. You will not learn the course content well if you do not attend regularly. Also, if you are irregular in your attendance (for unexcused reasons), you cannot expect to receive individualized help. Further, I sometimes decide to offer a makeup exam. If I decide to do so in this class, your record of attendance and problem set completion will be used to determine eligibility for the make-up exam and how heavily a make-up can count in your grade. I will usually record attendance using a sign-in procedure. I will pass out the sign-in sheet at the start of class. **If you come late to class, you will miss the opportunity to sign in and will be counted as "absent" for that class. Also, if you leave class early without clearing it with me, you will be counted as "absent."**

V. Cell Phones

Please turn them off and put them away when you come to class. Cell phones absolutely must be put away during exams. **If your cell phone is out during an exam, that is grounds for a 0 on the exam.**

V. Grade Assignment

A. Exams: 75 points for Exam 1 and 100 points each for Exams 2, 3 and 4.

B. Problem sets: 25 points (there will be 11 graded problem sets, giving you a chance to earn up to 8 bonus points)

C. Attendance

1. Lectures: Attendance will be taken in lectures. If you attend more than 80% of the lectures, you will receive 2 bonus points for each class above the 80% cutoff. **If you attend fewer than 80% of the lectures lectures, you will receive a deduction of 5 points for each class below the cutoff.**
2. Labs: Attendance will be taken in labs, not including the 3 exams. If you attend more than 8 of the 11 labs, you will receive 2 bonus points for each class above 8 (i.e., up to 6 bonus points). **If you attend fewer than 8 labs, you will receive a deduction of 5 points for each class below the expected 8.**

NOTE: Because there is ample opportunity to earn full credit for attendance, excuses for missed classes and labs will **not** be accepted except in **very** unusual circumstances, such as a **documented** serious chronic illness. Please don't come in at the end of the semester to try to justify any problems meeting this requirement.

D. Final grade calculation

Grades will be computed on a basis of 400 points (i.e., the 4 exams plus the problem sets). If you perform very well on problem sets, you have an opportunity to earn up to 8 bonus points. If you attend lecture and lab conscientiously, you have an opportunity to earn an additional 12 bonus points. HOWEVER, poor attendance will actually penalize you. For example, if you attend only half of the lectures and labs (i.e., 14 lectures and 5 labs), you will receive a deduction of 55 points!

It is expected that grades will be assigned based on the following point breakdowns:

Grade	A	B	C	D	E
Points	360 or more	320-359	280-319	240-279	239 or less