

# Psychology 302 - Statistical Methods in Psychology <br> Fall 2011 

Lecture: Mondays and Wednesdays 8:30am - 9:50am, Straub 142
Labs: Mondays (12-1:20pm or 2-3:20pm) or Tuesdays (2-3:20pm or 4-5:20pm), Straub 180

Instructor: Naomi Aguiar<br>Email: naguiar@uoregon.edu<br>Office: 390 Straub Hall<br>Office hours: Wednesdays, 1:30-3:30pm

In a recent article in the Economist, Chief Economist for Google, Hal Varian, mentioned that jobs for statisticians will be come the "sexiest" (i.e. most coveted) in the marketplace (see February $27^{\text {th }}$, 2010 issue). According to Varian, data are collected almost everywhere, but we have more data than we can possibly analyze. And, there are relatively few who people can extract meaning from the large amount of data we collect.

We are excited to offer this course because we feel it will give you a foundation of skills needed to succeed in today's economy, whether you choose to continue on in Psychology, or seek professions in other fields.

Lab instructors:
Email:
Office:
Office hours:

Kim Martin
kimm@uoregon.edu
344 Straub Hall
Monday 1:20-2:20pm
Friday $1-2 \mathrm{pm}$

> | $\begin{array}{c}\text { Alex Khounlavouth } \\ \text { amk@uoregon.edu }\end{array}$ |
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| 353 Straub Hall |
| Monday 3:30 - 4:30 |
| Tuesday 1:30-2:30 |

Straub Computer Lab rooms (180 and 186) are open Monday through Friday 8am - 5pm

## OVERVIEW OF COURSE STRUCTURE

Course Objectives: By the end of this course, you should have a solid understanding of the ways in which statistical techniques are used in psychology. This includes the ability to understand and critically evaluate graphical presentations of data, the ability to identify the appropriate statistical approach for a given research question, and an understanding of the factors that contribute to the interpretation of a statistical test (e.g., effect sizes and statistical power). Additionally, at the end of this course, you should able to conduct statistical tests (both by hand and using statistical software) and draw the appropriate conclusions (written in APA style) based on your analyses.

Course Description: This class can be thought of as applied or conceptual mathematics. Although you will be learning how to do statistical calculations by hand, this course is very different from courses taught in mathematics departments. 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 methods that is more difficult. Once you understand the concepts, you will probably have little trouble doing calculations.

Course Design: The course promotes active learning - through discussion, 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.

## COURSE REQUIREMENTS

1. Participation. Participation includes in-class group activities. Participation points can only be gained from inclass exercises. Credit is based NOT whether you got the right answer, but on whether you tried. You can miss up to 2 classes (for any reason) without penalization. After two free absences, a single point will be deducted for each missed class. There are no make-up opportunities for participation points.
2. 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 SPSS (a data analysis software package that is accessible in lab classrooms), and some using both methods. Turn homework in on time! Homework is considered late if it is not turned in at the beginning of your lab on the day it is due. In calculating your final grade, your lowest homework score will be replaced with your highest homework score, but ONLY if you turn in all 9 homework assignments within the terms designed by the late policy.

Late work will be penalized according to the following schedule:

| 1 day late: | -2 points | $(13 / 15)(86.7 \%)$ maximum |
| :--- | :--- | :--- |
| 2 days late: | -4 points | $(11 / 15)(73.3 \%)$ maximum |
| 3 days late: | -6 points | $(9 / 15)(60 \%)$ maximum |

No homework will be accepted after the $3{ }^{\text {rd }}$ day.
This policy is designed to encourage you to stay on top of your homework, as it will be vital to your success on exams, and in this course in general.
3. Quizzes. You will have 40 minutes to complete each quiz (half of a lecture period). Be on time!! Quizzes will cover all material since the previous quiz and might include multiple choice questions, true/false questions and short answer questions. Quizzes are closed book and are completed individually. You may bring calculators on quiz days, but they must be basic, 5 function calculators. Also, you are not allowed to use cell phones as calculators on quiz days. On quiz days, we will have a half lecture for 40 minutes following the quiz. You may sit quietly or leave and return if you finish a quiz early but you may not leave the room until I have your test form. Absolutely no texting or other use of electronic devices during scheduled quiz time.

At the end of the term, you will have the option of taking a "make-up" quiz, which will replace the lowest of your 5 quiz scores. Therefore, if you miss a quiz (and have a score of 0 for that quiz), the makeup quiz can be used to replace that. This is the only option for making up missed quizzes - no exceptions! On the final day of lecture, you will have 35 minutes to complete quiz 5 , followed by 35 minutes to complete the make-up quiz.
4. Books \& Calculator. The required text is Essentials of Statistics for the Behavioral Sciences (Nolan \& Heinzen, 2011). There is a website the accompanies this textbook:
http://bcs.worthpublishers.com/nolanessentials1e/default.asp - t_585030
It is free to register and includes chapter outlines, flashcards and practice quizzes. I STRONGLY recommend using this resource to help you prepare for quizzes.

Read assigned chapters before class and do "check your learning" sections as you encounter them. Reread if you encounter trouble on a "check your learning" section. You will also need a hand-held calculator that can do single variable statistics. No need for graphing calculators. Bring calculator \& text to class.

## COLLABORATION

## Collaborative Learning:

Discussing homework with other students and your instructors is encouraged, as are homework and study groups for quizzes and exams. 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 that was written independently (no photocopies 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 homework with each other, but preparing those answers for your homework and the actual writing of any verbal answers need to be done independently.

Individual Work (when Collaboration = Cheating):
Your work on the quizzes must be your own. Any verbal statements on homework MUST be written in YOUR OWN WORDS. If you are caught cheating, the following consequences apply:

## Cheating on homework:

First offense: " 0 " on homework assignment and homework will be counted as not turned in.

Second offense: An "F" in the course. Infraction will be reported to the Office of Student Conduct and Community Standards.

## Cheating on a quiz:

An " $F$ " in the course. Infraction will be reported to the Office of Student Conduct and Community Standards.

The University may impose additional penalties in accordance with the student conduct code: http://studentlife.uoregon.edu/StudentConductandCommunityStandards/StudentConductCode/tabid/69/Default.aspx

SPECIAL NEEDS
Students with Disabilities: If you have a documented disability and may need accommodations, contact us ASAP. There is no way we can help you if you come to us with a documented disability at the end of the term. Also, 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; 346-1155; http://ds.uoregon.edu/).

Student Athletes: You must let me know during the first week of classes if you will miss class due to travel with a UO athletic team and require accommodation. Requirements for the course will not be relaxed for student athletes, however minor scheduling accommodations may be made (e.g., taking a quiz a few hours early) if planned well ahead of time.

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.

## GRADING

Your final course grade is based on the following components:

135 points (48\%) Score on 9 homework assignments worth 15 points each (lowest score will be replaced
125 points (45\%) Score on 5 quizzes worth 25 points each (there will be one make-up one quiz at the end of the term if you would like to replace your lowest quiz score)
20 points (7\%) Participation in in-class exercises worth 1 point per class (you can miss up to two points without penalty)

Note that there is NO EXTRA CREDIT. Final grades will be based on percentage of total possible points earned, distributed as follows:
A+ 97.5-100\%
B+ 87.5-89.4\%
C+ 77.5-79.4\%
D+67.5-69.4\%
Pass/No Pass:
A 92.5-97.4\%
B $82.5-87.4 \%$
C 72.5-77.4\%
D 62.5-67.4\%
P: 70\% and up
A-89.5-92.4\%
B-79.5-82.4\%
C-69.5-72.4\%
D - $59.5-62.4 \%$
$\mathrm{N}: ~ 69 \%$ or lower

## COURSE SCHEDULE

## *Schedule, homework due dates and quiz dates subject to change

| Date | Topic | Readings | Quizzes/HW |
| :---: | :---: | :---: | :---: |
| WEEK 1 |  |  |  |
| 9/26 | Course intro, statistics and research designs | Ch. 1 |  |
| Lab 1 |  |  |  |
| 9/28 | Visual Displays of Data | Ch. 2-3 |  |
| WEEK2 |  |  |  |
| 10/3 | Central Tendency and Variability | Ch. 4 |  |
|  | Lab 2 |  | HW 1 Due |
| 10/5 | Z scores, and the Normal Distribution | Ch. 6 (p.117-132) |  |
| WEEK 3 |  |  |  |
| 10/10 | Probability and the Normal Distribution | Ch. 7 (p.147-155) | Quiz 1 |
|  | Lab 3 |  | HW 2 Due |
| 10/12 | Distribution of Sample Means | Ch. 6 (p.132-139) |  |
| WEEK4 4 4 4 |  |  |  |
| 10/17 | Hypothesis Testing with z | $\begin{gathered} \text { Ch. } 5 \text { (p. } 103-109) \& \text { Ch. } \\ 7 \text { (p.155-167) } \end{gathered}$ |  |
|  | Lab 4 |  | HW 3 Due |
| 10/19 | Confidence intervals, Effects Size and Statistical | Ch. 8 | Quiz 2 |
| WEEK 5 - |  |  |  |
| 10/24 | The one-sample and paired samples t-tests | Ch. 9 |  |
|  | Lab 5 |  | HW 4 Due |
| 10/26 | The independent samples t-test | Ch. 10 |  |
| WEEK 6 |  |  |  |
| 10/31 | Intro to ANOVA | Ch. 11 (p. 256-260) |  |
|  | Lab 6 |  | HW 5 Due |
| 11/2 | One-way ANOVA | Ch. 11 (p. $261-280$ ) | Quiz 3 |
| WEEK 7 |  |  |  |
| 11/7 | Two- Way ANOVA | Ch. 12 |  |
|  | Lab 7 |  | HW 6 Due |
| 11/9 | Within subjects ANOVA, ANOVA Review | Ch. 11 (p. 281-292) |  |
| WEEK 8 |  |  |  |
| 11/14 | Correlation | Ch. 13 |  |
|  | Lab 8 |  | HW 7 Due |
| 11/16 | Regression | Ch. 14 | Quiz 4 |
| WEEK 9 |  |  |  |
| 11/21 | Chi-Square | Ch. 15 |  |
|  | Lab 9 |  | HW 8 Due |
| 11/23 | More Chi-Square |  |  |
| WEEK 10 |  |  |  |
| 11/28 | Which Test? Review and Recap |  |  |
|  | Lab 10 |  | HW 9 Due |
| 11/30 | Quiz 5, Makeup Quiz |  |  |

## HOMEWORK ASSIGNMENTS

*Homework assignments subject to change
Put your name and your TA's name on all homework, and please staple. If unstapled, you must put your name on every sheet. All work must be neat and legible. If we can't read it we can't grade it!

Problems are at the end of each chapter. Turn homework in on time! To earn full credit, show and explain all work. For problems completed by hand, show all steps. *Annotate* SPSS output to receive full credit: Circle the most important numbers and explain (write or type directly and legibly on the output) what they mean. You must demonstrate that you are able to read and understand what you have produced. In addition, for any problem that includes hypothesis testing, you must include all steps of hypothesis testing including an APA style summary of your results. The book has answers to odd-numbered problems in the back. Use these for extra practice or to check your work.

## Homework 1: Concepts, variables and visual representations of data ( 15 pts.)

- Ch 1: problems 1.3*, 1.4, \& 1.34a
*For question 1.3, please explain in your own words why the changes you made to the statements are correct.
- Ch 2: problem 2.24a*, b,
*For question 2.24a, in addition to creating a frequency table, draw a histogram.
- Ch 3: problems 3.1* \& 3.14
*For question 3.1, please list the techniques and provide an example.


## Homework 2: Central Tendency and Variability ( 15 pts.).

- Ch 4: problems 4.12, 4.14, 4.16*, \& 4.40*
* For question 4.16, calculate the range, variance and standard deviation of the SAMPLE (not the population)
*For question 4.40abc, complete all using SPSS. Be sure to include a histogram to answer part c.
Homework 3: z scores and the Normal Curve ( 15 pts)
- Ch 6: problems 6.6, 6.14, 6.16, \& 6.30*
*For question 6.30 you MAY use the formulas if it helps you.
- Ch 7: problems 7.16, 7.18, 7.29, \& 7.30


## Homework 4: The CLM, z -tests, and confidence intervals, power and effect size ( 15 pts )

- Ch 6: problems 6.8, 6.10, 6.26, \& 6.40bcfg
- Ch 7: problem 7.48cd*
* For question 7.48 d , you must have read the assigned reading in chapter 5!

[^0]* For problem 8.15, USE YOUR OWN WORDS. Do not simply copy the answer from the back of the book.


## Homework 5: Single-Sample $\boldsymbol{t}$ Tests and Paired Samples $\boldsymbol{t}$ tests ( $\mathbf{1 5}$ pts)

- Ch 9: problems 9.6, 9.10, 9.12, 9.39a*, \& 9.46*
* For problem 9.39, conduct test by hand AND with SPSS, but only go through the 6 steps of hypothesis testing ONCE. Be sure to generate an effect size (Cohen's d) by hand. Interpret the effect size in your APA summary.
* For problem 9.46, conduct test by hand AND with SPSS, but only go through the 6 steps of hypothesis testing ONCE. Be sure to generate an effect size (Cohen's d) by hand. Interpret the effect size in your APA summary.


## Homework 6: Independent Samples T-tests ( $15 \mathbf{p t s}$ )

## - Ch 10: problems 10.4, 10.8, 10.9*, 10.37*, 10.38*, \& 10.48

* For problem 10.9, USE YOUR OWN WORDS. Do not simply copy the answer from the back of the book.
*For problem 10.37, conduct test with SPSS. Be sure to generate an effect size by hand and interpret in your APA summary.
*For problem 10.38, conduct test by hand. Be sure to generate an effect size by hand and interpret in your APA summary.


## Homework 7: One-Way ANOVA (15 pts)

- Ch 11: problems 11.3*, 11.7*, 11.15*, 11.28*, 11.29*, 11.54*, 11.63*
* For problems 11.3, 11.7, \& 11.15, USE YOUR OWN WORDS. Do not simply copy the answer from the back of the book.


## * For problems 11.28 \& 11.29, BE SURE TO SHOW YOUR WORK.

*For problem 11.54, conduct test by hand. For this problem, you do NOT need to conduct a post- hoc test by hand. However, in your APA summary, be sure to state whether or not a post hoc test is needed. Also, include a calculation of effect size and interpret it in your APA summary.

* For problem 11.63, conduct test with SPSS. Be sure to also conduct a post-hoc test and interpret it in you APA summary. Also, include a by-hand calculation of effect size and interpret it in your APA summary.


## Homework 8: Two- Way ANOVA (15 pts)

- Ch 12: problems 12.5*, 12.6, 12.8, 12.12, 12.38abcef, 12.41abce*, 12.42abc*
*For problem 12.5, USE YOUR OWN WORDS. Do not simply copy the answer from the back of the book.
* For problem 12.41, conduct test with SPSS and for part e, generate a line graph to show the interaction effect (if significant). Be sure to discus the main effects and interaction effect in you APA summary.
*For problem 12.42, see explanation for study on page 333. Conduct the test by hand. Be sure to include a source table and draw a line graph for the interaction effect (if significant). Be sure to discuss the main effects and interaction effects in you APA summary.


## Homework 9: Correlation and Regression (15 pts)

- Ch 13: problems 13.4, 13.6, 13.18*, 13.44*
*For question 13.18, generate the scatterplot using SPSS. Then describe the relationship between x and Y. Notice if there are any outliers. If so, eliminate the outlier and generate a new scatterplot with SPSS. Then describe the relationship between X and Y .
* For problem 13.44, conduct test by hand AND with SPSS, but only go through the 6 steps of hypothesis testing ONCE.
- Ch 14: 14.1*, 14.10, 14.12, 14.22, 14.28, \&14.42adeg*
* For problem 14.1, USE YOUR OWN WORDS. Do not simply copy the answer from the back of the book.
* For part14.28 a, generate a scatterplot using SPSS. For parts d \& e, complete by hand and with SPSS.


[^0]:    - Ch 8: problems 8.6, 8.12, \& 8.15*

