



# Psychology 312: Experimental Design and Quantitative Methods for Psychology

Fall/Winter 2006/2007

**Instructor:**

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**Course Blackboard Site:** <http://blackboard.ucalgary.ca>

**Required Textbooks**

Mitchell, M.L., & Jolley, J.M. (2007). *Research Design Explained* (6th Ed.). Belmont, CA: Thomson Wadsworth.

Howell, D.C. (2004). *Fundamental Statistics for the Behavioral Sciences* (5<sup>th</sup> Ed.). Belmont, CA: Thomson Wadsworth.

Mitchell, M.L., & Jolley, J.M., O'Shea, R.P. (2007). *Writing for Psychology* (2<sup>nd</sup> Ed.). Belmont, CA: Thomson Wadsworth.

Used earlier used editions of all three books may be available. While the content of earlier editions is not significantly different from the current editions, students should be advised that questions based on textbook material will be drawn from the current editions, so that it is not possible to guarantee tested material was covered in earlier editions.

**Course Overview**

Psychology 312 provides an introduction to evaluating and generating psychological knowledge. You will learn about research methods and quantitative analysis strategies widely used by psychologists in their research. The course focuses on quantitative approaches. Students interested in qualitative psychological research should consider Psychology 415, *Nonexperimental Research Methods in Psychology* upon completion of this course.

During the Fall term, the emphasis will be on understanding psychology as a scientific enterprise including an introduction to how quantitative information is used to understand psychological phenomena. We will consider various aspects of the scientific approach in psychology including:

- the logic of scientific inquiry
- how to evaluate research findings

- how psychological constructs are measured and systematically varied in research
- what we do to ensure our research findings are valid
- the development and testing of hypotheses
- research design
- quantitative description of psychological phenomena
- the role of probability in the logic of quantitative analysis
- conducting psychological research that is ethical

The Winter term curriculum is primarily focused on further developing your ability to carry out and interpret quantitative analysis of psychological data and draw appropriate conclusions from those analyses. By the end of the Winter term you will be both knowledgeable and practiced in the use of statistical procedures including:

- correlation and regression
- comparison of two groups (*t-test*)
- comparison of multiple groups (*ANOVA*)
- examining the effects of more than one factor on multiple groups (*factorial ANOVA*)
- multiple comparisons of the same research participants (*Repeated measures*)
- comparison of groups using categorical data (*Chi-Square*)
- knowing how effective statistical analyses are for detecting effects of interest (*Power analysis*)
- writing up research findings using the American Psychological Association (APA) format

The laboratory component of the course is designed to facilitate experiential learning (learning by doing) of the material, and hence the lab projects are integrated with the lecture schedule.

## Reflections on Effective Learning in Psychology 312

### *Blended Learning Format*

Blended learning refers to an instructional approach designed to enhance the classroom experience and extend learning through the use of Internet information and communication technology. In the context of this course it means we will be actively incorporating various electronic learning (e-learning) resources, primarily on the web, to optimize your learning experience. Much of the e-learning material has been developed specifically for this course in collaboration with upper level psychology students who have taken Psychology 312. Thus you will have a rich and well-crafted array of learning resources, in addition to your textbooks and lecture material. The expansion of e-learning in the course means there will be about 50% less lecturing. I will lecture during one of the weekly sessions; the second session each week *will* focus on experiential learning opportunities such as demonstrations, work exercises, answering questions, etc.. The focused learning classes are intended to provide a more interactive and in-depth treatment of the course material. Thus, compared to a traditional full lecture course, you will be doing *more* of your learning through independent work and *less* through the traditional lecture format. This has some important implications for how you approach the course if you want to do well – see the *Expectations of Students* section below.

### *One Instructor, One Lab Coordinator, Six Lab Instructors*

There are 12 lab sections for Psyc 312. In the same way that care has been taken to integrate textbook, e-learning, lectures, and class exercises, the same holds the lab sections. The laboratory coordinator, **Error! Contact not defined.**, oversees the conduct of the labs and we hold weekly meetings with the instructor, Juanita, and all the lab instructors to ensure comparability.

### *Principles Governing Instructor Responsibilities in Psychology 312*

Psychology 312 is the only year-long core course required of all psychology majors and is a prerequisite for many upper level psychology courses so your success is important. Mastery of the material in this course can serve you in a variety of ways in your future endeavours, including making you a much more sophisticated consumer of scientific knowledge claims for the rest of your life. Accordingly, we will endeavour to do our best to facilitate your success in the course and make the experience rewarding. Our guiding principles will be:

1. To continuously help you see why learning about psychological research and how to do it yourself is a useful, relevant, and exciting endeavour.
2. Through guided reading, lecture, e-learning, and experiential learning (primarily in the lab), we will provide you with the best possible learning opportunities that our resources permit. We will do our utmost to present material in the course accurately and in a well-organized fashion designed to help you master it.
3. Mastery in Psychology 312 is defined in terms of both expanded knowledge of research methods and statistical techniques *and* in-depth comprehension of the logic underlying them.
4. The course will set challenging but clear and achievable learning goals on the assumption that we learn the most when we aim high.
5. Assistance with achieving learning goals outside of class and lab will be provided through access to the professor, the lab instructors, and the Psyc Help Desk.

6. Fairness will govern our approach to evaluation and all other matters affecting students in the course. We will do our best to address concerns brought to our attention promptly.

### ***Expectations of Students***

Successful learning in Psychology 312 will reflect commitment and effort on our part and yours. We will expect students to achieve success and support the success of others by:

1. Assuming responsibility for being knowledgeable about all course related information, including *everything* in the course outline, lab assignments, deadlines, and test and examination dates. The Blackboard course site is your most important one stop resource in this regard. *We will assume you are checking for course announcements daily.* It will help us all if our time is not misspent providing information available through the Blackboard site.
2. Giving mastery of Psychology 312 the priority in your life it deserves. Make regular appointments with yourself to work with the material and absorb it. Although the blended learning format results in less traditional lecture time, this does *not* mean you will be spending less time or working less in this course than you would in a traditional full lecture course.
3. Appreciating that psychology has taught us much about successful study strategies. To help you use that knowledge, we will provide links to learning resources at the Blackboard site.
4. Understanding that lectures will not cover all material in the assigned readings *and* will incorporate material not covered in the readings. Furthermore, whether or not material is lectured on is not indicative of its importance for testing purposes. In other words, all lecture content and assigned reading is relevant and important for evaluation purposes.
5. Knowing that your mastery of course concepts will be most effective and satisfying through active study and work on assignments and exercises by yourself and/or with other students. For success in a blended learning course like this one, you must structure your time effectively, making plans for when and how you will work with the e-learning components of the course. Plan on taking advantage of the focused learning class each week as these sessions will be designed to help you with particularly difficult material *but will only be of use if you have read and studied the relevant material beforehand.*
6. Respecting course instructor time. By all means seek assistance from your instructors if you need it, but only after you've made a serious effort on your own. One-on-one time with an instructor can be crucial for clarifying concepts or helping with comprehension, but is wasted when the instructor is merely asked to re-present information presented in the readings or lecture. If you miss lecture or lab, make arrangements with another student in the course for class notes. There are 240 students in the course and 8 people involved in instruction each term. We will be available for one-on-one consultation but wish to use that time effectively and fairly and are dependent on your assistance and judgment to do so.
7. Respecting yourself and others. To this end, we expect you will attend class and lab regularly, arrive on time, and conduct yourself honourably on all exams and assignments.
8. Drawing our attention to any concerns with the course *as they arise.* We can only address problems when we know about them and are most effective in doing so when we know sooner rather than later.

### ***Math Phobia and Related Matters***

By virtue of the education you have to have to be registered in Psychology 312 (high school completion or equivalent), we firmly believe that every student has the mathematics skills (addition, subtraction, multiplication, division, square root) required to achieve a high level of success in this course. A number of the basic descriptive statistical concepts presented in the course (e.g., mean, standard deviation) are covered in the Alberta pre-high school curriculum. So, if you believe yourself to be math phobic or otherwise math challenged, please know that we believe these concerns are *irrelevant* for success in Psychology 312. If you believe in your basic math skills are rusty, Appendix A of the Howell text, is an arithmetic review.

If you find that thinking about phenomena in quantitative terms doesn't come easily for you, rest assured that the approach taken in this course to the presentation of quantitative concepts is designed to ensure *full* comprehension without reliance on mathematical derivation or proofs. However, for test and final exam purposes, calculators with basic arithmetic functions are highly recommended but must be stand-alone devices. **Programmable calculators and calculator functions in cell phones, PDAs, laptops, etc. are not allowed.**

### **Term Tests, Laboratory Assignments, and Final Exam Distribution of Credit**

Your final grade in Psychology 312 will be a weighted average of your grade in the laboratory component and the *best 5 grades* on the term tests and final exam (i.e., your lowest test or final exam grade will not count), using the following weightings:

Laboratory	30% (see separate Lab Outline)
Fall Session Test 1	11.67% October 5
Fall Session Test 2	11.67% November 7
Fall Session Test 3	11.67% (scheduled by Registrar)
Winter Session Test 4	11.67% February 6
Winter Session Test 5	11.67% March 13
Winter Session Test 6	11.67% (scheduled by Registrar)

In order to benefit from the best 5 grades provision, students must achieve at least 50% on **all six** tests. Thus you are expected to study and prepare for tests for **all** the course material. Students scoring below 50% on one or more tests will have their final grade based on all six tests.

The tests and final examination will include multiple choice and short answer questions and are non-cumulative insofar as they will be limited to material covered since the previous test. However, many of the concepts in this course are inherently cumulative in that they assume knowledge and understanding of material introduced earlier.

### **Absence From A Test**

Make-up exams are NOT an option without an official University medical excuse (see the University Calendar). You must contact Dr. Ellard before the scheduled examination or you will have forfeited any right to make up the exam. At the instructor's discretion, a make-up exam may differ significantly (in form and/or content) from a regularly scheduled exam. Except in extenuating circumstances (documented by an official University medical excuse), a makeup exam is written within two (2) weeks of the missed exam.

A completed Physician/Counselor Statement will be required to confirm absence from a test for health reasons. The student will be required to pay any cost associated with the Physician Counselor Statement.

**Academic Accommodation:**

*It is the student's responsibility to request academic accommodations.* If you are a student with a documented disability who may require academic accommodation and **have not** registered with the Disability Resource Centre, please contact their office at 220-8237. Students who have not registered with the Disability Resource Centre are not eligible for formal academic accommodation. You are also required to discuss your needs with your instructor no later than fourteen (14) days after the start of this course.

**Course Credits for Research Participation**

Students in most psychology courses are eligible to participate in Departmentally approved research and earn credits toward their final grades. To get 2% added to the final grade in a full course, like this one, you have to acquire a total of 4 research credits towards the course. These credits may be acquired in the Fall and/or in the Winter session. Students can create an account and access the Research Participation System website at <http://ucalgary.sona-systems.com>. The last day to participate in research is December 7, 2006 for the Fall term and April 12, 2007 in the Winter term.

**Assignment of Final Grades**

**NOTE:** Students must pass (50% or better) both the lecture and laboratory components of the course. An F grade in either the lecture or laboratory component will result in a final course grade of F.

Final letter grades for the course will be assigned as follows:

A+	96-100%	B+	80-84%	C+	67-71%	D+	54-58%
A	90-95%	B	76-79%	C	63-66%	D	50-53%
A-	85-89%	B-	72-75%	C-	59-62%	F	Less than 50%

Credits for research participation will be added to the final grade percentage. As stated in the University Calendar, it is at the instructor's discretion to round off either upward or downward to determine a final grade when the average of term work and final examinations is between two letter grades. To determine final letter grades, final percentage grades will be rounded up or down to the nearest whole percentage as appropriate (i.e., 89.5% will be rounded up to 90%; 89.4% will be rounded down to 89%, etc.).

**Reappraisal of Grades**

A student who feels that a piece of graded term work (term paper, essay, test, etc.) has been unfairly graded, may have the work re-graded as follows. The student shall discuss the work with the instructor within fifteen days of being notified about the mark or of the item's return to the class. If not satisfied, the student shall immediately take the matter to the Head of the department offering the course, who will arrange for a reassessment of the work within the next fifteen days. The reappraisal of term work may cause the grade to be raised, lowered, or to remain the same.

If the student is not satisfied with the decision and wishes to appeal, the student shall address a letter of appeal to the Dean of the faculty offering the course within fifteen days of the unfavourable decision. In the letter, the student must clearly and fully state the decision being appealed, the grounds for appeal, and the remedies being sought, along with any special circumstances that warrant an appeal of the reappraisal. The student should include as much written documentation as possible.

### **Plagiarism and Other Academic Misconduct**

Intellectual honesty is the cornerstone of the development and acquisition of knowledge and requires that the contribution of others be acknowledged. Consequently, plagiarism or cheating on any assignment is regarded as an extremely serious academic offense. Plagiarism involves submitting or presenting work in a course as if it were the student's own work done expressly for that particular course when, in fact, it is not. Students should examine sections of the University Calendar that present a Statement of Intellectual honesty and definitions and penalties associated with Plagiarism/Cheating/Other Academic Misconduct.

You should also consult discussion of these issues in psychology particularly with respect to citation and paraphrasing in your book *Writing for Psychology*, which also includes an "Academic Honesty Checklist" (p. 125). ***Copying another student's lab assignment, in whole or in part, is plagiarism.***

### **Important Dates**

The last day to withdraw from this course and still receive a fee refund is September 22, 2006. The last day to withdraw from this course is April 13, 2007.

### **Students Organizations**

Psychology students may wish to join the Psychology Undergraduate Students' Association (PSYCHS). They are located in the Administration building, room 170 or may be contacted at 220-5567.

**Student Union VP Academic:** Phone: 220-3911 [suypaca@ucalgary.ca](mailto:suypaca@ucalgary.ca)  
**Student Union Faculty Rep.:** Phone: 220-3913 [socialscirep@su.ucalgary.ca](mailto:socialscirep@su.ucalgary.ca)

### **Psychology Program Information**

The Department of Psychology's Undergraduate Director will visit the class to present information about the Psychology Department and its academic programs. Topics to be covered will include course and GPA requirements for general and honours B.A. and B.Sc. degrees, department structure and officers, appeal procedures, scholarship and awards opportunities, graduate school, and faculty references.

### **Getting Help**

This help directory outlines the help sources available for different questions you might have and how to reach the source:

Source	For What?	How?
Dr. Ellard	<ul style="list-style-type: none"><li>• General course issues</li><li>• Questions arising from lecture</li></ul>	<ul style="list-style-type: none"><li>• Office hours</li><li>• By appointment</li></ul>

Your Lab Instructor	<ul style="list-style-type: none"> <li>and reading material</li> <li>• Laboratory issues not resolved through the lab coordinator</li> <li>• Material presented in lab and lab assignments</li> <li>• Questions about lab assignment grading</li> </ul>	<ul style="list-style-type: none"> <li>• After class</li> <li>• Course email</li> <li>• Phone</li> <li>• Office hours</li> <li>• Email</li> </ul>
Lab Coordinator – Juanita Whalen	<ul style="list-style-type: none"> <li>• Questions about lab assignment grading</li> </ul>	<ul style="list-style-type: none"> <li>• By appointment</li> <li>• Email</li> </ul>
Psych Help Desk (see below)	<ul style="list-style-type: none"> <li>• Lab assignment questions when your lab instructor is unavailable.</li> </ul>	<ul style="list-style-type: none"> <li>• Drop in</li> <li>• Email: psychhelp@ucalgary.ca</li> </ul>
Course Blackboard Site (see below)	<ul style="list-style-type: none"> <li>• Powerpoint slides</li> <li>• E-learning resources</li> <li>• Assignments</li> <li>• Course announcements and schedule</li> <li>• Course specific and general learning Resources</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="http://blackboard.ucalgary.ca">http://blackboard.ucalgary.ca</a></li> </ul>

### Department of Psychology Help Desk

The Psychology Help Desk is a resource available to students in this course requiring assistance with their assignments and data analysis. Note that this service does not replace the regular lab instructor support for this course. When you have questions about your assignments, you should always first consult your assigned lab instructor. If you need assistance at times your instructor is not available, you may take advantage of this service. Graduate teaching assistants will be staffing the Psychology Help Desk during the week and will be familiar with the Psychology 312 assignments. These teaching assistants can also help with questions you may have about the lectures or the textbook. Visit the Help Desk's web page ([www.psych.ucalgary.ca](http://www.psych.ucalgary.ca)) for hours of operation and other information.

### The Psychology 312 Blackboard Website (<http://blackboard.ucalgary.ca>)

This resource is designed to make course information and material available to you at your convenience. It will be monitored and updated daily, so you should make a habit of checking it often. Important information available at the site includes:

1. All course documents including the course outline, laboratory schedule, and assignments.
2. Downloadable Powerpoint slides for lectures and materials for focused learning classes. These will be made available 24 hours before each lecture, with three slides per page and space to write notes beside each slide. You are encouraged to print the slides and bring them to class so you will not have to copy the slide information during lecture. This will allow you to better attend to and make notes on other lecture material.  
**NOTE:** The Powerpoint slides outline concepts covered in lecture and are not full lecture notes.
3. A course calendar with all test dates and due dates for assignments.
4. Announcements.
5. Links to course specific and general learning resources.



## Frequently Asked Questions

Q - I missed a lecture and I need the notes.

A - The Powerpoint slides for each lecture are available at the course Blackboard site <http://blackboard.ucalgary.ca>, but you will need to get the complete course notes from another student.

Q - I have a question about SPSS.

A - Questions about SPSS can be directed to either your lab instructor or to the Psychology Help Desk

Q - I have questions about a laboratory assignment.

A - Talk to your lab instructor during laboratory time or office hours or consult the Psychology Help Desk.

Q - I have a question about a lecture.

A - Talk to your instructor after class, during office hours, or send an email. You can also consult your lab instructor or the Psychology Help Desk.

Q - I would like to review my exam. What do I do?

A - Contact the Lab Coordinator, Juanita Whalen ([jwhalen@ucalgary.ca](mailto:jwhalen@ucalgary.ca)) to make an appointment to go over your exam.

Q - I would like to appeal the mark I received on a lab assignment.

A - First review that assignment with your lab instructor. If you are unable to resolve the matter with your instructor, contact the Lab Coordinator, Juanita Whalen ([jwhalen@ucalgary.ca](mailto:jwhalen@ucalgary.ca)), to have your lab assignment reviewed. If you still have concerns after reviewing your lab assignment, make an appointment to see Dr. Ellard.

Q - I would like to appeal the mark I received on an exam.

A - First contact the Lab Coordinator, Juanita Whalen ([jwhalen@ucalgary.ca](mailto:jwhalen@ucalgary.ca)), to make an appointment to review your exam. If you still have concerns after reviewing your exam, make an appointment to see Dr. Ellard.

## University of Calgary Curriculum Objectives

Based upon the structure and the content of this course, the following Core Competencies are addressed:

1. *Critical and creative thinking:* Learning the conceptual and mathematical basis of the General Linear Model (GLM) will help develop these skills. In addition, these skills will be developed through learning about sound research design strategies and how to solve design-related problems.  
*Analysis of problems:* This course stresses problem solving by learning how to choose and design effective research strategies, and by choosing effective analytical approaches to test specific hypotheses emanating from the research.
2. *Effective oral and written communication:* Students are encouraged to participate in class and laboratory discussions, and the course requires that students write brief papers, a research report, and exams (including a written component).
3. *Gathering and organizing information:* Laboratory assignments require that information is both gathered and organized; for example, students write a research paper where they collect and organize data for analysis purposes.

4. *Logical calculation, mathematical ability:* Statistical analyses require the computation of formulae, and the course helps develop basic mathematical skills – especially in the area of basic algebra.
5. *Abstract reasoning and its applications:* Many of the concepts covered in the areas of research design, measurement, and analysis require the ability to think abstractly. In particular, parametric statistical analysis is based upon the highly abstract and theoretical concepts of sampling and probability distributions.
6. *Interpretive and assessment skills:* Students are commonly required to critically assess research designs and interpret the results of data analyses.

Based upon the structure and the content of this course, the following Curriculum Redesign Features are addressed in this course:

1. *An experiential learning component relevant to the program objectives:* The laboratory component of the course enables students to apply the material learned through lectures and reading, and assists in developing their research design and analytical skills.

Topic	Readings Mitchell & Jolley	Readings Howell	Online Units
<i>Introduction to Research Methods</i>			
Psychology and Science, the Role of Statistics	Ch. 1	Ch. 1	1. Psychology and Science 5. Statistics Concepts
Ethics	Ch. 2		2. Ethics
Generating and Refining Research Hypotheses	Ch. 3		3. Generating and Refining Research Hypothesis
Reading and Evaluating Research	Ch. 4		4. Reading and Evaluating Research
<i>Measurement</i>			
Measuring and Manipulating Variables	Ch. 5		7. Measurement: Reliability 8. Construct Validity
<b>Test 1 – Thursday October 5</b>			
Choosing the Best Measures	Ch. 6	Ch. 2	6. Measurement: Scaling & Sensitivity
Descriptive Methods	Ch. 7 pp. 162-180		9. Overview 10. Archival Data 11. Observation
<i>Internal Validity</i>	Ch. 9		14. Internal Validity 13. Regression to the Mean
<i>Descriptive Statistics</i>			
Plotting Data		Ch. 3	15. Displaying Data: Overview 16. Stem & Leaf Displays 17. Histograms 18. Graphs
Measures of Central Tendency		Ch. 4	19. Measures of Central Tendency
<b>Test 2 – November 7</b>			
Measures of Variability		Ch. 5	20. Measures of Variability

*Introduction to Hypothesis  
Testing*

The Normal Distribution

Ch. 6

22. The Normal Distribution

23. Z-scores

Probability Theory

Ch. 7

12. Basics Concepts of  
Probability

Hypothesis Testing

Ch. 10 pp.  
279-308

Ch. 8

25. Hypothesis-testing

30. Sampling Distributions and  
Hypothesis-testing

26. Type I and II Errors

27. One and Two-tailed Tests

**Test 3 – scheduled by Registrar**

Topic	Readings Mitchell & Jolley	Readings Howell	
<i>Correlation and Regression</i>			
Correlation	Ch. 7 pp. 187-204	Ch. 9	28. Correlation
Regression		Ch. 10	29. Regression
Multiple Regression		Ch. 11	33. Multiple Regression
<b>Midterm Test 4 – Tuesday February 6</b>			
<i>Simple Experiments and Hypothesis Tests of Means</i>			
The One Sample $t$ Test		Ch. 12	31. Hypothesis Testing for the Mean: One Sample 32. Confidence Limits on the Mean
The $t$ Test for Independent Groups	Ch. 7 pp. 185-187 Ch. 10	Ch. 14	35. The Simple Experiment: Comparing Two Groups 36. Hypothesis Testing Two Means: Independent Samples
<i>Statistical Power</i>		Ch. 15	34. Power
<i>Multiple Group Experiments and Analysis of Variance</i>			
Multiple Group Experiments and One-Way ANOVA	Ch. 11	Ch. 16	38. The Multiple Group Experiment 39. One-Way ANOVA 40. Multiple Comparison Procedures
<b>Test 5 – Tuesday March 13</b>			
Factorial Experimental Designs and ANOVA	Ch. 12	Ch. 17	42. Factorial Designs 43. Factorial ANOVA

*Repeated Measures*

Within-subjects Designs

Ch. 13 pp.  
392-409,  
418-425

44. Matched Pair Designs  
45. Within-Subject Designs

The *t*-test for Related Samples

Ch. 13

37. Hypothesis Testing Two  
Means: Related Samples

Repeated Measures Analysis of  
Variance

Ch. 18

46. Repeated Measures ANOVA

*Chi-Square*

Ch. 19

47. Chi-Square

*Practical Matters*

Choosing the Right Analysis

Ch. 21

49. Selection Among Statistical  
Procedures

Research Writing

Ch. 15

52. Writing Research Reports

SPSS

57. Using SPSS

Graphing

58. Creating Graphs in SPSS and  
Excel

**Final Exam – scheduled by Registrar**