

**University of Waterloo
Department of Psychology
Psych 391
Advanced Data Analysis
Fall 2022**

Mondays and Wednesdays 10:30 - 11:50, RCH302

Updated September 5th, 2022

Instructor and T.A. Information

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Teaching Assistants

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Kaiden Stewart

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Office Hour: Wednesday 4:30-5:30

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Lab: 104 (Wednesday 3:30-4:20)

Course Description

This course builds on the material covered in Psychology 292. Topics that will be covered include: t-tests, Power, ANOVA, factorial ANOVA, repeated measures and mixed designs, and multiple comparisons associated with those designs. The primary goal of the course is to provide students with a solid understanding of both the logic and computations underlying many of the statistical procedures that psychologists use when analyzing data collected from experiments. An additional goal for this course is that students will learn to perform these statistical analyses using SPSS. We will also be providing supplemental materials showing how to compute some of the main analyses using [R](#).

Course Goals and Learning Outcomes

Upon completion of this course, students should be able to:

- A. Look at a large range of statistical problems, and be able to determine:
 - what the independent and dependent variables are
 - which statistical analyses would be appropriate

- B. Accurately conduct (by hand and using SPSS) the appropriate:
 - Power analysis for simple 2-level designs
 - Descriptive and Inferential statistics for simple 2-level and complex (multi-factorial) designs

C. Report all of the analyses in APA format

Optional Text

Howell, D. C. (2017). *Fundamental Statistics for the Behavioral Sciences*. Wadsworth.

I will also provide a number of supplemental reading materials on LEARN

Information Available on LEARN

The course web page can be found on [LEARN](#). Here, you will find links to the syllabus, my lecture slides, lab assignments, practice questions (i.e., previous tests), and to important announcements. I will try my best to have the lecture slides for the upcoming lecture up at least 24 hours in advance of class time.

Course Requirements and Assessment

All tests and labs (see important dates below) will be based on material presented in the lectures and the lab tutorials.

Assessment	Date of Evaluation	Weighting
Test #1	October 5 th	20%
Test #2	November 9 th	20%
Test #3	Final Exam Period	30%
Lab Assignments (N=3)	October 3 th (5%), November 14 th (10%), December 5 th (10%)	25%
Video Participation	Sept 21 st , Sept 28 th , Oct 19 th , Nov 2 nd , Nov 16 th	5%
Research Participation		4%
Total		104%

Tests (70%)

In total, there will be three tests in this course. The content of the tests will be a combination of short answer and long answer, and will involve both conceptual and computational material.

Lab Assignments (25%)

There will be three lab assignments in this course. The first lab assignment will be worth 5%, and the second and the third, 10% of your final grade. As with all work in this course, **you are to complete the assignments on your own**. It is important that you show all of your work for each assignment (i.e., all calculations). For every day that an assignment is late, 25% will be deducted from your assignment grade. For example, if you received 100% on lab assignment 1 but submitted it one day late you would receive 75% on the assignment.

Video Participation Marks (5%)

Explainer videos have been prepared to support your learning of some of the key material for the course. Five marks of the 100% total attainable marks are made up of responding to and submitting answers to short questions based on the videos. Responses to these questions are to be submitted by the due date (i.e., Video 1 - **Sept 21st**, Video 2 - **Sept 28th**, Video 3 - **Oct 19th**, Video 4 – **Nov 2nd**, Video 5 - **Nov 16th**) to the respective dropbox folder.

SPSS Lab Tutorials

Each student should be registered in a lab section. Labs are intended to provide students with hands on experience with SPSS. For the most part, we will spend class time discussing the logic and rationale behind the statistical procedures covered in this course. The lab schedule is posted on page 4 of this syllabus.

Nexus Accounts

For the SPSS lab tutorials component of this class, you will need a NEXUS account. A NEXUS account will give you access to e-mail, the internet, and a host of different software packages (including SPSS which you will need for the lab assignments). It is strongly recommended that you activate your NEXUS account, find the SPSS statistical package, and become familiar with it before the first SPSS lab tutorial. You can obtain a NEXUS account by: (a) going to a NEXUS computer (e.g., one located in PAS 1237), (b) clicking on the link in the bottom-left corner of the login browser, and (c) following the instructions as they are given on the screen.

Lecture Schedule

Days	Topic	Readings	SPSS Tutorials	Video Participation
Sept 7	Introduction to course			
Sept 12	Review of Basic Concepts	Chap: H 1, 2, 4, 5, 6, 8		
Sept 14	Hypothesis Testing, T-tests (Handout L1)	Chap: H 12-14		
Sept 19	Power	Chap: H 15	Lab1	
Sept 21	ANOVA	Chap: H 16		T-tests
Sept 26	ANOVA	Chap: H 16	Lab2	
Sept 28	ANOVA	Chap: H 16		ANOVA
Oct 3*	ANOVA + Mid-term Review (L1 Due)	Chap: H 16		
Oct 5*	Test #1			
Oct 10 - 16*	No Classes – Reading week			
Oct 17	Multiple Comparisons: Planned comp	Chap: Sup 1	Lab3	
Oct 19	Multiple Comparisons: Planned comp	Chap: Sup 1		Linear Contrasts
Oct 24	Multiple Comparisons: Post Hoc (Handout L2)	Chap: Sup 1	Lab4	
Oct 26	Multiple Comparisons: Post Hoc	Chap: Sup 1		
Oct 31	Factorial ANOVA	Chap: H 17	Lab5	
Nov 2	Factorial ANOVA	Chap: H 17		Factorial ANOVAs
Nov 7	Factorial ANOVA & Midterm Review	Chap: H 17		
Nov 9*	Test #2			
Nov 14*	Repeated Measures (Handout L3, L2 Due)	Chap: H 18, Sup 2	Lab6	
Nov 16	Repeated Measures	Chap: H 18, Sup 2		RM ANOVAs
Nov 21	Mixed Designs	Sup 2	Lab7	
Nov 23	Mixed Designs	Sup 2		
Nov 28	Factorial Repeated Measures	Sup 2	Lab8	
Nov 30	Factorial Repeated Measures (3-Factor Experiments)	Sup 2		
Dec 5*	Final Review (L3 due)	Sup 2		

H - Refers to the Howell's text entitled "*Fundamental Statistics for the Behavioral Sciences*"

Sup - Refers to two chapters from supplemental readings.

L1-L3: Refers to the three lab assignments

Lab Tutorial/Review Schedule

Lab#	Date	Objective
No Lab	Week of Sept 12 th	----
Lab 1	Week of Sept 19 th	Intro to SPSS, t-tests
Lab 2	Week of Sept 26 th	One-way ANOVA
No Lab	Week of Oct 3 rd	----
Review Session	Monday Oct 4 th	Available for questions on Tuesday before Test #1 (location and time TBA)
Lab 3	Week of Oct 17 th	Multiple Comparisons: A Priori
Lab 4	Week of Oct 24 th	Multiple Comparisons: Post Hocs
Lab 5	Week of Oct 31 st	Factorial ANOVA with post hocs
No Lab	Week of Nov 7 th	----
Review Session	Tuesday Nov 8 th	Available for questions on Tuesday before Test #2 (location and time TBA)
Lab 6	Week of Nov 14 th	Repeated Measures ANOVA with post hocs
Lab 7	Week of Nov 21 st	Mixed Factorial ANOVA with post hocs
Lab 8	Week of Nov 28 th	Repeated Measures ANOVA
Review Session	TBA	Available for questions on day before Test #3 (location and time TBA)

Research Experience Marks

Information and Guidelines: Experiential learning is considered an integral part of the undergraduate program in Psychology. Research participation is one example of this, article review is another. A number of undergraduate courses have been expanded to include opportunities for Psychology students to earn grades while gaining research experience.

Since experiential learning is highly valued in the Department of Psychology, students may earn a **"bonus" grade of up to 4%** in this course through research experience. Course work will make up 100% of the final mark and a "bonus" of up to 4% may be earned and will be added to the final grade if/as needed to bring your final grade up to 100%. The two options for earning research experience grades (participation in research and article review) are described below. Students may complete any combination of these options to earn research experience grades.

Option 1: Participation in Psychology Research: Research participation is coordinated by the Research Experiences Group (REG). Psychology students may volunteer as research participants in lab and/or online (web-based) studies conducted by students and faculty in the Department of Psychology. Participation enables students to learn first-hand about psychology research and related concepts. Many students report that participation in research is both an educational and interesting experience. Please be assured that all Psychology studies have undergone prior ethics review and clearance through a University of Waterloo Research Ethics Committee.

Educational focus of participation in research: To maximize the educational benefits of participating in research, students will receive feedback information following their participation in each study detailing the following elements:

- Purpose or objectives of the study
- Dependent and independent variables
- Expected results
- References for at least two related research articles
- Provisions to ensure confidentiality of data
- Contact information of the researcher should the student have further questions about the study

- Contact information for the Director of the Office of Research Ethics should the student wish to learn more about the general ethical issues surrounding research with human participants, or specific questions or concerns about the study in which s/he participated.

Participation in LAB studies is worth 0.5 participation credits (grade percentage points) for each 30-minutes of participation. Participation in ONLINE studies is worth .25 credits for each 15-minutes of participation. Researchers will record student's participation and will advise the course instructor of the total credits earned by each student at the end of the term.

How to participate?

Study scheduling, participation and grade assignment is managed using the SONA online system. All students enrolled in this course have been set up with a SONA account. You must get started early in the term.

[INSTRUCTIONS/DATES/DEADLINES: How to log in to Sona and sign up for studies](#)

**** Please do not ask the Course Instructor or REG Coordinator for information unless you have first thoroughly read the information provided on this website.****

More information about the REG program is available at: [REG Participants' Homepage](#)

Option 2: Article Review as an alternative to participation in research: Students are not required to participate in research, and not all students wish to do so. As an alternative, students may opt to gain research experience by writing short reviews (1½ to 2 pages) of research articles (i.e., scientific journal articles) relevant to the course. *You must contact your TA to get approval for the article you have chosen before writing the review.* Each review article counts as one percentage point. To receive credit, you must follow specific guidelines. The article review must:

- **Be submitted before the last lecture. Late submissions will NOT be accepted under ANY circumstances.**
- Be typed
- Fully identify the title, author(s), source and date of the article. A copy of the article must be attached.
- Identify the statistical concepts in the article and critically evaluate the application or treatment of those concepts in the article. If inappropriate or incorrect, identify the error and its implications for the validity of the article. You may find, for example, misleading headings, faulty research procedures, alternative explanations that are ignored, failures to distinguish factual findings from opinions, faulty statements of cause-effect relations, errors in reasoning, etc. Provide examples whenever possible.
- Clearly evaluate the application or treatment of those concepts in the article.
- Keep a copy of your review in the unlikely event we misplace the original.

Academic Integrity

In order to maintain a culture of academic integrity, members of the University of Waterloo are expected to promote honesty, trust, fairness, respect and responsibility. Check the [Office of Academic Integrity webpage](#) for more information.

Discipline

A student is expected to know what constitutes academic integrity, to avoid committing academic offences, and to take responsibility for their actions. Check [the Office of Academic Integrity](#) for more information. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 – Student Discipline. For information on categories of offenses and types of penalties, students should refer to [Policy 71 - Student Discipline](#). For typical penalties check [Guidelines for the Assessment of Penalties](#).

Concerns about a Course Policy or Decision

Informal Stage. We in the Psychology Department take great pride in the high quality of our program and our instructors. Though infrequent, we know that students occasionally find themselves in situations of conflict with their instructors over course policies or grade assessments. If such a conflict arises, the Associate Chair for Undergraduate Affairs (Richard Eibach) is available for consultation and to mediate a resolution between the student and instructor: Email: reibach@uwaterloo.ca; Ph 519-888-4567 ext. 48790.

Grievance

A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70 - Student Petitions and Grievances](#), Section 4. When in doubt, please be certain to contact Richard Eibach, the Associate Chair for Undergraduate Affairs who will provide further assistance; reibach@uwaterloo.ca.

Appeals

A decision made or penalty imposed under Policy 70 - Student Petitions and Grievances (other than a petition) or Policy 71 - Student Discipline may be appealed if there is a ground. A student who believes they have a ground for an appeal should refer to [Policy 72 - Student Appeals](#).

Note for Students with Disabilities

The [AccessAbility Services](#) office, located on the first floor of the Needles Hall extension (NH 1401), collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the AS office at the beginning of each academic term.

Accommodation for course requirements for Psychology courses.

Policies of the Psychology department pertaining to course requirements are available on the [department website](#).

Chosen/Preferred First Name

Do you want professors and interviewers to call you by a different first name? Take a minute now to verify or tell us your chosen/preferred first name by logging into [WatIAM](#). Why? Starting in winter 2020, your chosen/preferred first name listed in WatIAM will be used broadly across campus (e.g., LEARN, Quest, WaterlooWorks, WatCard, etc). Note: Your legal first name will always be used on certain official documents. For more details, visit [Updating Personal Information](#).

Important notes

- If you included a preferred name on your OUAC application, it will be used as your chosen/preferred name unless you make a change now.
- If you don't provide a chosen/preferred name, your legal first name will continue to be used.

Mental Health Support

All of us need a support system. The faculty and staff in Arts encourage students to seek out mental health support if they are needed.

On Campus

- Counselling Services: counselling.services@uwaterloo.ca / 519-888-4567 ext. 32655
- **MATES**: one-to-one peer support program offered by the Waterloo Undergraduate Student Association (WUSA) and Counselling Services

Off campus, 24/7

- **Good2Talk**: Free confidential help line for post-secondary students. Phone: 1-866-925-5454
- Grand River Hospital: Emergency care for mental health crisis. Phone: 519-749-4300 ext. 6880
- **Here 24/7**: Mental Health and Crisis Service Team. Phone: 1-844-437-3247
- **OK2BME**: set of support services for lesbian, gay, bisexual, transgender or questioning teens in Waterloo. Phone: 519-884-0000 extension 213

Full details can be found online on the Faculty of Arts [website](#)

Download [UWaterloo and regional mental health resources \(PDF\)](#)

Download the [WatSafe app](#) to your phone to quickly access mental health support information.

Academic freedom at the University of Waterloo

[Policy 33, Ethical Behaviour](#) states, as one of its general principles (Section 1), "The University supports academic freedom for all members of the University community. Academic freedom carries with it the duty to use that freedom in a manner consistent with the scholarly obligation to base teaching and research on an honest and ethical quest for knowledge. In the context of this policy, 'academic freedom' refers to academic activities, including teaching and scholarship, as is articulated in the principles set out in the Memorandum of Agreement between the FAUW and the University of Waterloo, 1998 (Article 6). The academic environment which fosters free debate may from time to time include the presentation or discussion of unpopular opinions or controversial material. Such material shall be dealt with as openly, respectfully and sensitively as possible." This definition is repeated in Policies 70 and 71, and in the Memorandum of Agreement, Section 6.

Territorial Acknowledgement

We acknowledge that we are living and working on the traditional territory of the Attawandaron (also known as Neutral), Anishinaabe and Haudenosaunee peoples. The University of Waterloo is situated on the Haldimand Tract, the land promised to the Six Nations that includes ten kilometres on each side of the Grand River. For more information about the purpose of territorial acknowledgements, please see the [CAUT Guide to Acknowledging Traditional Territory](#).